The Madrid Protocol and Beyond: Strategies for Marine Conservation in the High Seas and Southern Ocean

by

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DECLARATION

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the Thesis. To the best of my knowledge and belief, this Thesis contains no material previously published or written by another person except where due acknowledgement is made in the text. Some material published and researched by me has been included and duly acknowledged in the content of this thesis. These references include:

Harris JW (in press) Agreement for the Conservation of Albatross and Petrels. In: *Encyclopedia of the Antarctic*, Routledge, New York, United States of America (invited contribution).

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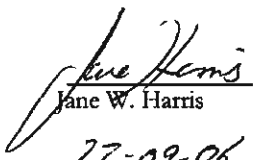

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ABSTRACT

The establishment of Marine Protected Areas (MPAs) on the high seas has recently emerged on the international agenda as a critical issue requiring the integration of novel approaches, international cooperation and political will. Since the high seas are subject to open access, the rights and obligations of States on the high seas can be ambiguous and confusing. There is a need to clarify how high seas marine conservation can be implemented under international law and in the Antarctic, both within and beyond the instruments of the Antarctic Treaty System (ATS). In recent years, Antarctic Treaty Consultative Parties have pondered the application of alternative international approaches and instruments in the region. This study seeks to contribute to this debate, assessing the ATS and key international instruments and approaches regarding their applicability to the high seas, comprehensiveness (assessed by species, *in-situ* or *ex-situ* conservation measures), progressiveness (application of the ecosystem or precautionary approach) and their legal status (soft or hard law, entry into force, Contracting Parties).

Site selection for Southern Ocean MPAs is hindered by a lack of data on marine biodiversity. This study uses seabirds as surrogates for marine biodiversity. Drawing on a 20-year database comprising over 140,000 'at sea' seabird sightings, this study assesses the potential use of seabirds as surrogates for marine biodiversity in the Indian sector of the Southern Ocean. Surrogate indices used were species density, richness, IUCN status and Shannon-Weaver diversity. The seabird observations were aggregated into 1° (n = 1952), 2° (n = 704) and 5° bins (n = 177). Surrogates were classified as high, medium or low, with 'high' areas of greatest conservation value. The study identified 22 urgent priority areas where conservation action appears justified, with clusters near Heard and McDonald Islands, and Isles Crozet.

Integrating policy with science and considering area selection techniques provides an objective contribution to Antarctic conservation planning. Antarctic marine conservation is best managed within the ATS, with strong involvement from the Commission for the Conservation of Antarctic Marine Living Resources. The ATS could, however be strengthened by applying the principles and approaches used by key international instruments, particularly the Convention on Biological Diversity and the United Nations Convention on the Law of the Sea. The use of seabirds as surrogates has value in Antarctic conservation planning, but additional species or environmental data would improve the process.

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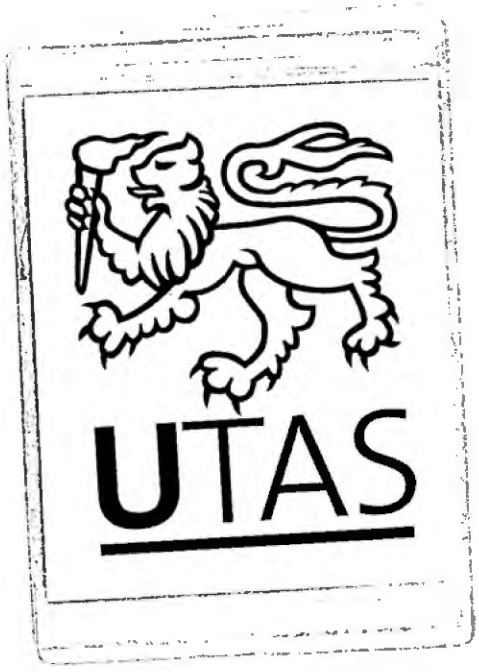
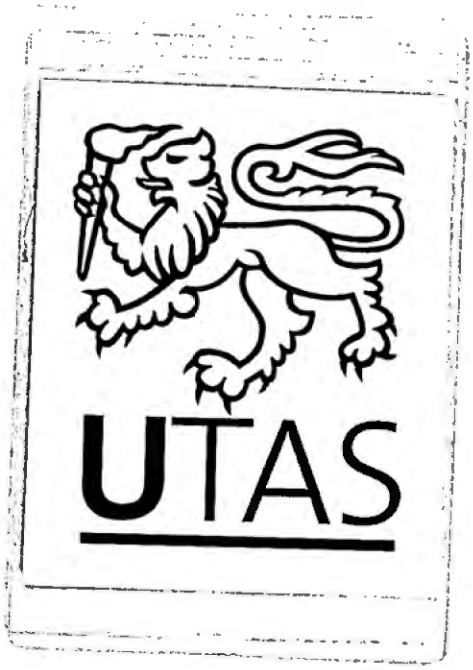


Acronyms and Abbreviations

AAD	Australian Antarctic Division
ACAP	Agreement on the Conservation of Albatrosses and Petrels
Agreed Measures	Agreed Measures for the Conservation of Antarctic Fauna and Flora
ASMA	Antarctic Specially Managed Area
ASOC	Antarctic and Southern Ocean Coalition
ASPA	Antarctic Specially Protected Area
ASTI	Areas of Special Tourist Interest
ATCM	Antarctic Treaty Consultative Meeting
ATCP	Antarctic Treaty Consultative Party
ATS	Antarctic Treaty System
BirdLife	BirdLife International
BWM Convention	International Convention for the Control and Management of Ships' Ballast Water and Sediments
CBD	Convention on Biological Diversity
CCAMLR Commission	Commission for the Conservation of Antarctic Marine Living Resources
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CCAS	Convention for the Conservation of Antarctic Seals
CCRF	Code of Conduct for Responsible Fisheries
CDS	Catch Documentation Scheme
CE	Critically Endangered (IUCN Red List)
CEE	Comprehensive Environmental Evaluation
CEP	Committee for Environmental Protection
CEMP	CCAMLR Ecosystem Monitoring Program
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COMNAP	Council of Managers of National Antarctic Programmes
Compliance Agreement	Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas
COP	Conference of Parties
CRAMRA	Convention on the Regulation of Antarctic Mineral Resources Activities
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EN	Endangered Species (IUCN Red List)
ESRI	Environmental Systems Resource Institute Incorporated
FAO	United Nations Food and Agriculture Organisation
FMO	Fisheries Management Organisation
FSA	Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks
GIS	Geographical Information System
HSM	Historic Sites or Monuments
IAATO	International Association of Antarctica Tourist Operators

IBA	Important Bird Area
ICRW	International Convention for the Regulation of Whaling
IGY	International Geophysical Year
IEE	Initial Environmental Evaluation
IMO	International Maritime Organisation
IPOA	International Plan of Action
IPOA-IUU	IPOA to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing
IPOA-Seabirds	IPOA for Reducing Incidental Catch of Seabirds in Long-line Fisheries
ISA	International Seabed Authority
IUCN	World Conservation Union
IUU	Illegal, unreported and unregulated
IWC	International Whaling Commission
Jakarta Mandate	Jakarta Mandate on Marine and Coastal Biodiversity
LOSC	United Nations Convention on the Law of the Sea
LSSSG	Life Sciences Standing Scientific Group
MAB	Man and the Biosphere Programme
Madrid Protocol	Protocol on Environmental Protection to the Antarctic Treaty
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto
MEPC	Marine Environment Protection Committee
Montreal Protocol	The Montreal Protocol on Substances that Deplete the Ozone Layer
MOU	Memoranda of Understanding
MSSSI	Marine Sites of Special Scientific Interest
MUPA	Multiple-Use Protected Area
MPA	Marine Protected Area
NGO	Non Government Organisation
NPOA	National Plan of Action
PAP	Protected Areas Programme
PAS	Protected Area System
POP	Persistent Organic Pollutants
PSSA	Particularly Sensitive Sea Areas
Ramsar	Convention on Wetlands of International Importance Especially as Waterfowl Habitat
RFMO	Regional Fisheries Management Organisation
RSA	Regional Seas Agreement
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
SCAR	Scientific Committee for Antarctic Research
SCAR-WGB	SCAR Working Group on Biology
SC-CCAMLR	Scientific Committee to CCAMLR
SPA	Specially Protected Area
SPS	Specially Protected Species
SRA	Specially Reserved Area
SSSI	Sites of Special Scientific Interest
The Committee	Intergovernmental Committee for the Protection of the Cultural and Natural Heritage of Outstanding Universal Value
TPA	Terrestrial Protected Area
UNCED	United Nations Conference on Environment and Development

UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
VU	Vulnerable Species (IUCN Red List)
VMS	Vessel Monitoring Systems
WCMC	World Conservation Monitoring Centre
WCPA	World Commission on Protected Areas
WHC	World Heritage Convention
WSSD	World Summit on Sustainable Development
WWF	World Wildlife Fund



Chapter 1

1 INTRODUCTION

The Antarctic is acknowledged as being one of the most comprehensively protected regions in the world (Kelleher et al. 1995a), however "[t]he establishment of a systematic environmental and geographical framework of protected areas within the Antarctic region has yet to be achieved" (Kelleher et al. 1995a: 55). Ten years on this is still the case (Valencia 2000, ATCM XXVIII / WP11 2005). Conservation approaches include measures for species, *in-situ* and *ex-situ* conservation and can be implemented at a local, regional or international level. In the case of the Antarctic, both international and regional instruments apply. This study considers how these instruments apply to the Antarctic and more specifically, the Southern Ocean. Marine conservation is the focal point of this study.

In the Antarctic, marine protected areas (MPAs) have been recognised as having inadequate representation, with most simply an extension of terrestrial protected areas rather than MPAs in their own right. The development of an MPA network is being considered by the CCAMLR Commission for the Conservation of Antarctic Marine Living Resources (the CCAMLR Commission). The CCAMLR Commission held an MPA workshop in 2005 and concluded that in order to develop a system of Southern Ocean MPAs, more scientific information was required (CCAMLR Commission 2005). The CCAMLR Commission is unlikely to finalise a system of MPAs until after the Antarctic marine bioregionalisation has been completed, which is likely to be several years away, but workshop participants agreed that in the interim it may be necessary to designate pilot MPAs (CCAMLR Commission 2005). Given that there is not full information on Southern Ocean marine biodiversity (nor is there ever likely to be), this study considers the use of biodiversity surrogates to aid in area prioritisation, selection and designation for the Southern Ocean. The use of biodiversity surrogates – or proxies – to represent overall biodiversity is a method that is commonly applied to identify MPAs (Brooks et al. 2001, Gladstone 2002, see also Chapter 2). A case study, using seabird sightings at sea for the Indian sector of the Southern Ocean, is undertaken to assess how useful seabirds can be as surrogates for Southern Ocean marine biodiversity. Studies have shown that bird distribution and abundance can be a good indicator of the general biodiversity of an area (Garson et al. 2002, Diamond and Devlin 2003, BirdLife

International 2004, Fleishman 2005), and the case study identifies a series of potential areas for conservation action in the Southern Ocean based upon areas exhibiting high conservation values for birds.

1.1 Global Marine Conservation

As the human population continues to grow, so does the demand for its resources. Until relatively recently, the exploitation of the world's marine living resources has been undertaken with little regard for the long-term conservation and sustainable use of those resources (Phillips 1998, Crosby 2000). Marine living resources had been viewed by many as inexhaustible (FAO 1996, Phillips 1998, Crosby 2000). This view is no longer supported, as evidenced by widespread fisheries collapse and dramatic ecosystem change influenced by factors such as fishing down the food web (Pauly et al. 1998, Croxall and Nicol 2004) and global climate change (Soto 2001, Gjerde and Breide 2003). Conservation approaches have largely been reactive rather than proactive, and have often been applied too late to reverse the damage caused by unsustainable human activities and exploitation (Boesch 1999, Agardy 2000, Kaye et al. 2000, Gell and Roberts 2002).

The marine environment is subject to many threats and amongst the most significant are fisheries. It is estimated that between 72 to 78 per cent of the world's fisheries are fully-exploited, over-exploited or depleted (Gjerde 2003). Illegal, unreported and unregulated (IUU) fishing is a massive problem, particularly in the high seas and Southern Ocean (Tasker et al. 2000, Croxall and Nicol 2004). Over-capitalisation of fishing fleets is a major factor, and changes in marine jurisdiction have led to fisheries displacement from traditional fishing grounds to the high seas (Kaczynski 1985, Kimball 2001). Non-target species by-catch and fishing down the food web are ongoing threats to marine biodiversity (Gilman 2001, Baker et al. 2002, ATCM XXVII / IP98 2004).

Other threats to the marine environment are climate change, pollution (from ships and land-based sources), alien and introduced species, commercial bioprospecting, minerals exploration and exploitation, scientific research, tourism pressures and unforeseen events such as oil spills, ozone depletion and coral bleaching (Gilman 2001, Gjerde 2003, Gjerde and Breide 2003). The isolation and extreme environment of the Antarctic mean that the region is not subject to the same level of pressures or threats as other

regions of the globe (Constable 2004), however it is no longer immune to threats and cannot be considered to be the pristine environment that it once was.

The environmental movement gained momentum in the 1980s and soon advocated the adoption of an ecosystem approach[1] to resource management, and the application of the precautionary approach (Lewis Smith et al. 1994, FAO 1996, Gerrodette et al. 2002, FAO Fisheries Department 2003). The precautionary approach to management reverses the burden of proof, such that where threats to biodiversity exist, a lack of scientific evidence should not prevent action to mitigate those threats[2]. The definition of conservation has over the years evolved not only to apply to strictly protected areas and species, but also to embrace the concept of sustainable (or rational) use. Rational use, as defined under the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), refers to prevention of a decrease in the size of any harvested population to levels below those which ensure its stable and greatest net annual recruitment, the maintenance of ecological relationships between harvested and dependent and associated species, and the prevention of irreversible changes in the marine ecosystem (Article 2.3).

Global and regional environmental initiatives have been influenced by inter-governmental organisations such as the United Nations Environment Programme (UNEP), the Food and Agriculture Organisation (FAOs) and International Maritime Organisation. Non-governmental organisations (NGOs) such as the World Conservation Union (IUCN), Greenpeace and the Antarctic and Southern Ocean Coalition (ASOC) have lobbied, raised public awareness and influenced policy making both on a global and regional scale. Within the Antarctic region scientific advisory bodies such as the Scientific Committee on Antarctic Research (SCAR) and its various working groups, and the Committee for Environmental Protection (CEP) have also

[1] An ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organisation which encompass the essential processes, functions and interactions among organisms and their environment, and among ecosystems. It recognizes that humans, with their cultural diversity, are an integral component of ecosystems (CBD Liaison Group on the Ecosystem Approach (1999) Report of the Liaison Group on the Ecosystem Approach. UNESCO, Paris 15-17 September).

[2] The CBD states in that the precautionary approach should be applied such that "where there is a threat of significant reduction or loss of biological diversity, lack of scientific certainty should not be used as a reason for postponing measures to avoid or minimise such a threat" (CBD preamble).

played their part in the development of policy bolstered by the best scientific advice available.

Area protection, both terrestrial and marine, is perhaps the most prevalent tool for conservation[3] on a global scale. The IUCN defines a protected area as "an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and/or natural and associated cultural resources, and managed through legal or other effective means" (IUCN 1994:7). The IUCN advocates the legal protection of sites within national legislation, and provide six protected area classifications from the most strictly managed protected areas (Ia and Ib) to areas that may accommodate sustainable/multiple uses (VI) (see Chapter 2). Protected areas are recognised as a leading approach to protecting biodiversity *in-situ* (Green and Paine 1997). In the marine environment, designation of MPAs is a widely adopted method for the conservation of marine living resources. MPAs are commonly viewed as fishery management tools, however there is growing realisation that MPAs can be designated for the protection of other values such as aesthetic, tourism or scientific reference areas (Botsford et al. 2003). The fisheries and other pressures that are being applied to marine resources have brought about a global movement towards marine conservation, but to date the majority of MPAs are in areas within national jurisdiction and coastal regions (Probert 2002). MPA management, monitoring and enforcement is not a simple task, and common concerns that scientists and managers have include the appropriate selection, delineation and designation of a representative system of MPAs (Gubbay 1995, Gjerde and Breide 2003).

The need for the development of a global representative system of MPAs was emphasised at the 2002 World Summit on Sustainable Development (WSSD), and the Antarctic forms an integral part of that global system[4] (Kelleher et al. 1995a)[5]. An

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[3] For the purposes of this research the term conservation can include rational/sustainable use.

[4] For more information see Kelleher G, Bleakley C, Wells S (1995a) A global representative system of marine protected areas, Volume 1. Antarctic, Arctic, Mediterranean, Northwest Atlantic, Northeast Atlantic and Baltic., Vol 1. Great Barrier Reef Marine Park Authority (Australia), World Bank, IUCN - The World Conservation Union, Washington, D.C. 262pp.

[5] See also Kelleher G, Bleakley C, Wells S (1995b) A global representative system of marine protected areas, Volume 2. Wider Caribbean, West Africa and South Atlantic, Vol 2. Great Barrier Reef Marine Park Authority (Australia), World Bank, IUCN - The World Conservation Union, Washington, D.C. 118pp, Kelleher G, Bleakley C, Wells S (1995c) A global representative system of marine protected areas, Volume 3. Central Indian Ocean, Arabian Seas, East Africa and East Asian Seas, Vol 3. Great Barrier Reef Marine Park Authority (Australia), World Bank, IUCN - The World Conservation Union, Washington, D.C.

additional concern is the high costs associated with monitoring and enforcement (Dunn et al. 1999, WWF 2001), and in the high seas this poses a particular challenge since monitoring of all areas is impractical and expensive (IUCN 1991, 2004). There are also ambiguities regarding the rights and obligations of States on the high seas which causes confusion and can make enforcement problematic. For example, the United Nations Convention on the Law of the Sea (LOSC) declares the high seas as open-access, but also says that States have a duty for the conservation and sustainable use of high seas resources.

Conservation options on the high seas do exist (IUCN 1991, Anon 2001, IUCN 2004, Kaye 2004). International law that provides measures for the conservation of the marine environment and its fauna and flora can in many cases be applied to the high seas via flag State jurisdiction (Rayfuse 1998, Warner 2000, Kaye 2004). This means that if a State has signed an agreement such as LOSC, then their nationals must meet their obligations under that instrument (as set forth in national legislation) irrespective of their location. Therefore, it is appropriate to consider international instruments and approaches that facilitate the conservation of marine areas and assess their applicability to the high seas and/or the Antarctic.

The following instruments and approaches[6] are considered in this study in terms of their potential contribution towards conservation in the high seas:[7] the International Convention for the Regulation of Whaling (ICRW); the United Nations Educational, Scientific and Cultural Organisation's (UNESCO) Man and the Biosphere Programme (MAB); the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar); the World Heritage Convention (WHC); the Convention

176pp, Kelleher G, Bleakley C, Wells S (1995d) A global representative system of marine protected areas, Volume 4. South Pacific, Northeast Pacific, Northwest Pacific, Southeast Pacific and Australia/New Zealand, Vol 4. Great Barrier Reef Marine Park Authority (Australia), World Bank, IUCN - The World Conservation Union, Washington, D.C. 258pp.

[6] The instruments (or approaches) are listed in chronological order based upon the date of signature or formation of program/organisation.

[7] The instruments explored as part of this assessment are all international in their scope, have been subject to relatively widespread global adoption, and can be interpreted to apply to the coastal/marine environment. Instruments that incorporate the precautionary and ecosystem approaches are of particular interest since they tend to have more comprehensive measures for the protection of marine living resources. International instruments that address transboundary or high seas conservation issues are the most critical to consider for more immediate action since they already have measures in place that apply on the high seas, or have at least highlighted the need for participating States to consider and conserve the marine living resources of the high seas.

on International Trade in Endangered Species of Wild Fauna and Flora (CITES); the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78); UNEP's Regional Seas Program; the Convention on the Conservation of Migratory Species of Wild Animals (CMS) (and the Agreement on the Conservation of Albatrosses and Petrels (ACAP)); LOSC; the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (FSA); BirdLife International's (BirdLife's) Important Bird Area (IBA) Program; the United Nations Framework Convention on Climate Change (UNFCCC); the Convention on Biological Diversity (CBD); Agenda 21 (Chapter 17); the FAO and their Code of Conduct on Responsible Fisheries (CCRF).

Consideration of measures adopted in this selection of international agreements and approaches could have substantial conservation benefits for the Antarctic. Indeed, in some cases the instruments of the Antarctic Treaty System (ATS) have provided the international community with valuable insights into the application of progressive conservation approaches (De Fontaubert et al. 1996, Kimball 2001, Bush 2002). The 1959 Antarctic Treaty is a framework instrument and the foundation of the ATS. Other instruments of the ATS comprise the 1972 Convention for the Conservation of Antarctic Seals (CCAS); CCAMLR, and the 1991 Protocol on Environmental Protection to the Antarctic Treaty (Madrid Protocol). CCAMLR's early adoption of the ecosystem and precautionary approach is a prime example of this (CCAMLR Commission 2003, Grant 2005). Furthermore, the evolution of the ATS provides a unique example that demonstrates the ability of States to cooperate towards a common goal to designate the Antarctic as an area for peace and science (Beck 1986, IUCN 1991, Bush 2002).

1.2 Antarctic Marine Conservation

The Antarctic has numerous values and uses that make its conservation and sustainable use of vital importance both now and in the future. The Madrid Protocol highlights the need to protect the scientific, environmental, historic, aesthetic, wilderness values within Antarctic Specially Protected Areas (Article V.3), and management of Multiple Use Planning Areas where an area is subject to various uses and/or values (Article V.4). Both CCAS and CCAMLR facilitate the management and protection of the commercial

values of Antarctic marine living resources, and the importance of preserving scientific baseline areas[8] for monitoring programs.

Antarctica is surrounded by the Southern Ocean, which is largely high seas. High seas areas are not subject to national jurisdiction and the obligations of States with respect to their activities on the high seas can be subject to varying interpretation, however generally speaking the high seas are subject to open access. There is a need to address threats to the high seas, and to protect the intrinsic values of the Antarctic (Gustavo 2000, Valencia 2000). This begs the question: Can the ATS continue to comprehensively protect the Antarctic and its fauna and flora, or does a need exist to consider and apply other international instruments and approaches for their conservation in the Antarctic? There is also a need to consider whether the ATS can co-exist with other international instruments and approaches.

The Southern Ocean has a long history of commercial exploitation. Seals were targeted in the 18th century, followed by the establishment of commercial whaling in the early 19th century (Beck 1986, CCAMLR Commission 2003). In some cases seabirds were exploited for their eggs and oil (CCAMLR Commission 2003). More recently Antarctic krill and some finfish species have been targeted by both trawlers and longline vessels, which has had devastating effects on seabirds as by-catch (Constable et al. 2000, Croxall and Nicol 2004, Miller 2004).

Activities taking place in the Antarctic are subject to regulation under the instruments of the ATS however this only applies to States that have signed the various instruments of the ATS. Additionally, States must meet their obligations under other international instruments to which they are signatories, and whose measures can be interpreted to apply in the Antarctic region.

The 1959 Antarctic Treaty stipulates that the Antarctic is to be used for peaceful purposes and is an area of international cooperation and freedom of scientific research. Conservation was not an explicit objective of the Antarctic Treaty (although in Article IX the Treaty compels Parties to create measures for the preservation and conservation

[8] Baseline research refers to areas inviolate of human activity. Baseline areas are considered to be of high scientific value to compare and measure change over time with respect to other areas affected by human activity.

of Antarctic living resources), but in time the ATS evolved and incorporated instruments that have addressed emerging environmental concerns. The 1964 Agreed Measures for the Conservation of Antarctic Fauna and Flora (Agreed Measures) declared the Antarctic as a 'special conservation area', incorporating measures for the protection of- and prevention of harmful interference with- native fauna and flora. The Agreed Measures also enabled area and species protection and encouraged international scientific cooperation and information sharing. Commercial sealing operations had demonstrated the vulnerability of the marine living resources in the region, leading to the adoption of CCAS, which aimed to ensure the long-term survival of seals and preserve the ecological integrity of the region (Preamble). CCAS provisions allow for species and area protection and management while simultaneously providing a framework for the regulation of commercial sealing, should it resume. Similarly, CCAMLR was developed due to concerns regarding the vulnerability of the Southern Ocean to over-fishing and ecosystem pressures. Importantly, CCAMLR was pre-emptive rather than reactive since it was negotiated before substantial commercial fisheries had been established in the Southern Ocean. The primary aim of CCAMLR is the conservation of Antarctic marine living resources (Article 2) and significantly, the CCAMLR definition of conservation incorporates rational use. CCAMLR is essentially a fisheries management tool that incorporates the ecosystem approach to address dependent and associated species. The CCAMLR region is defined by ecological rather than political boundaries. Furthermore, recognising the level of uncertainty in fisheries and marine science, CCAMLR advocates the precautionary approach to fisheries management, since krill are widely perceived as a critical component of the Antarctic ecosystem (Alonzo et al. 2003, Nicol 2003). CCAMLR has provisions allowing for species and area protection and also addresses external factors that influence monitoring and enforcement such as flags of convenience, vessel monitoring systems (VMS) and trade (e.g. catch documentation schemes – CDS). The Madrid Protocol is a fundamental component of the ATS and is largely based upon, and has superseded, the Agreed Measures. The Madrid Protocol addresses environmental impact assessment (EIA); the conservation of Antarctic fauna and flora; waste disposal and management, prevention of marine pollution; area protection and management and more recently liability arising from environmental emergencies.

When considering the various threats that the world's oceans currently face, the ATS is now a strong framework with which to address the majority of those risks. The challenge now facing Antarctic Treaty Consultative Parties (ATCPs) is to continue to facilitate the evolution of the ATS so that it can address emerging global environmental concerns and mitigate future threats (SCAR 1961, Kimball 1985, Kakabadse 2000, Clark and Harris 2003). The approach taken could be either within or outside the ATS; but regardless it must be informed by international instruments and approaches in its decision-making process. Implementation of a representative system of MPAs in the Antarctic has yet to be achieved (Grant 2005), and poses a substantial challenge due to the lack of data available on the marine environment, particularly for the Southern Ocean. A case study is undertaken to explore one method by which Antarctic MPAs may be identified and prioritised for possible protection in a network of Southern Ocean MPAs.

1.3 Identifying High Priority Southern Ocean MPAs

The identification of prospective MPA sites in the Southern Ocean is by no means a simple task. Data on the marine environment on a global scale are inadequate (Ward et al. 2000), and this is exacerbated in the Southern Ocean due to the challenging environmental conditions, the isolation of the region and the high costs associated with data collection. Since the recognition of the precautionary approach, conservation of the marine environment no longer relies on the burden of proof (i.e. evidence that damage is occurring or a threat is present) in order to protect sites. Also, CCAMLR's mandate for the conservation of Antarctic marine living resources suggests a need to make decisions now, and to allow for adaptive management based upon improved understanding in the future. This study considers how areas may be selected in the Southern Ocean for protection or designation as MPAs.

The use of surrogates for biological diversity can be a means by which to prioritise areas when complete information is unavailable. In the case of the Indian sector of the Southern Ocean, a dataset comprising over 140,000 sightings of seabirds at sea (with associated environmental variables) is used to test its relevance as a surrogate for Southern Ocean marine biodiversity. Four surrogate measures are explored in this study: species density, species richness; IUCN conservation status (endangered - EN or

vulnerable - VU) and the Shannon-Weaver Diversity Index[9]. Areas that display a high measure for any or all of these surrogates may be identified as high priority sites worthy of protection as part of a representative network of high seas MPAs in the Southern Ocean.

1.4 Research Scope

1.4.1 Objectives

The specific research questions to be addressed in this study are:

1. Can the ATS accommodate marine conservation and sustainable use in the Southern Ocean?
2. What other international instruments and approaches may be applicable to the high seas and/or Southern Ocean?
3. Can we use seabirds as surrogates for marine biodiversity to identify high priority areas for conservation action in the Southern Ocean?

The primary focus is to consider Antarctic marine conservation from a policy perspective. This involves an assessment of measures for the protection of the Antarctic and its dependent and associated ecosystems under the ATS. However, there may be options for marine conservation in the Southern Ocean beyond the scope of the ATS. Therefore, this study also considers a selection of alternative international instruments and approaches that may apply to the Southern Ocean.

Following on from the policy component of the study, the issue of area selection in the Southern Ocean high seas is explored. MPAs are amongst the most critical and widely recognised tools for the conservation of marine living resources worldwide (Green and Paine 1997, Gjerde and Breide 2003). Area selection is an important issue to consider, since a lack of data on the marine environment has prevented the development of a systematic and representative system of Antarctic MPAs to date. The CCAMLR Commission has delayed implementation of a system of MPAs in the Antarctic until after the Southern Ocean bioregionalisation has been completed, but some areas may

[9] Species density refers to the abundance of species. Species richness is the number of individual species. IUCN status refers to species listed as Vulnerable (VU) or Endangered (EN) on the IUCN Red List Status IUCN (2001) IUCN Red List Categories and Criteria: Version 3.1, IUCN Species Survival Commission, IUCN, Gland, Switzerland and Cambridge, UK. The Shannon-Weaver Diversity Index is a biodiversity measure that incorporates species density and richness.

require protection before the bioregionalisation has been finalised (CCAMLR Commission 2005). The question of how to select high priority areas for conservation action in the Southern Ocean needs to be addressed. The issues pertaining to data quality and paucity within the marine environment, and in particular for the Southern Ocean, indicate a need to consider how high seas areas may be selected using available data sources. Existing data may be useful as a surrogate (or proxy) for marine biodiversity. A case study is undertaken using at-sea seabird sightings compiled over the last 20 years and comprising over 140,000 records within the Indian sector of the Southern Ocean. Possible biodiversity surrogates are considered to assess their potential efficacy to identify and prioritise candidate MPAs in the Southern Ocean.

1.4.2 Limitations

This study aims to identify and assess the potential for international instruments and approaches to be applied in the Antarctic for high seas conservation and sustainable use. Drawing upon this assessment, and using biodiversity surrogates, high priority areas will be identified in the Indian sector of the Southern Ocean. These areas may be considered as candidate MPAs or merely areas of importance to seabirds. Further research may be required to investigate the habitat and environmental characteristics of the sites and the presence of other species in order to verify the urgency or priority for protection of any particular area. Furthermore, an assessment of site-specific threats could contribute to the decision-making process but is not undertaken here.

Other data sources such as fisheries statistics or sightings of other wildlife have not been included in this study. The application of fisheries statistics could significantly enhance the results and contribute to the understanding of predator-prey relationships and whether areas being targeted by fisheries are also of importance to seabirds. If this is the case then consideration should be given to whether areas of potentially conflicting uses need to be managed differently to ensure the long-term conservation of marine living resources as required by the CCAMLR Commission's mandate.

Environmental data are not used in this study to aid in the selection of candidate MPAs. There is scope for future research to consider how environmental data could enhance the results and assist in determining the relationship between marine living resources and environmental characteristics. This study does not attempt to delineate MPAs or address issues of MPA design at a site or at network levels. It is a preliminary

assessment of the policy context of MPAs in the Southern Ocean and possible options for area selection taking into account data limitations.

The cost of establishing a network of MPAs in the Antarctic is not considered here, and may be a promising area for future research. Furthermore, the monitoring and enforcement of a network of high seas MPAs in the Southern Ocean, although mentioned in this study, are not explored in detail. The associated costs of creating and managing Antarctic MPAs will be substantial, and a logical next step would be to develop some funding scenarios that would be realistic for the region and to assess how practical any proposed MPA is in this context.

1.4.3 Outline

Chapter 1 provides an introductory overview of the research undertaken in this study. Southern Ocean marine conservation is placed into a regional and international context to understand the relevance and application of the research with respect to global and Antarctic marine conservation efforts. Also outlined are the research questions that will be investigated and tested.

The research design adopted in this study is outlined in Chapter 2. The two-tiered approach and methodology of the research are described. First, the methodology behind the policy-based evaluation is summarised. A critical assessment of the literature is conducted to assess how effective the ATS is in providing a framework for the conservation of species, habitats and ecosystems of the Antarctic. This critical evaluation reviews the possible connections and conflicts between the instruments of the ATS and other international and regional instruments. The second component of the research describes the methodology behind the case study, which uses a database of at-sea seabird sightings to assess their use as surrogates for marine biodiversity. The data processing and preparation process is described, and a justification and background regarding the use of biodiversity surrogates is provided.

The global context of the research is discussed in Chapter 3. International instruments and approaches are described, and particular emphasis is placed on the development of marine conservation - particularly through marine protected areas. The background of the instruments are described, followed by an outline of the status, evolution and analysis of key international instruments, organisations and approaches.

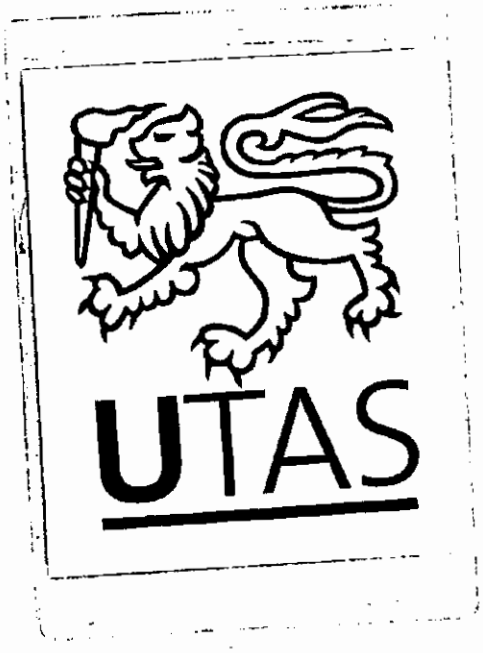
In Chapter 4, the history, exploration and exploitation of the Antarctic is described and placed into a regional and international context with regard to the development of the environmental movement. The role of the ATS in governing the Antarctic is discussed to provide insight into the ability of the ATS to facilitate conservation and sustainable use within a global framework. Each instrument is described in terms of its background, status and evolution particularly as it relates to marine conservation and the Southern Ocean.

Chapter 5 explores international instruments and approaches with particular reference to key aspects that address the marine environment or the high seas. The strengths and limitations of the ATS and selected international instruments are considered. A discussion follows which considers appropriate international instruments and approaches that may assist the ATCPs in pursuing the objectives of the conservation and sustainable use of Antarctic marine living resources.

The application of at-sea seabird sightings as surrogates for marine biodiversity in the Southern Ocean is considered within Chapter 6. Four derived surrogates are tested for their potential use: species density, species richness, IUCN Status (EN or VU) and the Shannon-Weaver Diversity Index. Areas that are characterised by high values on each of the surrogates are isolated as high conservation value areas at three different spatial scales: 1° x 1° degree; 2° x 2° and 5° x 5°latitude/longitude. Finally, a group of the highest priority areas is identified by selecting areas that appear as high-scoring areas for the surrogate measures and at three spatial scales. The possible contributing factors are discussed and key areas identified within the Indian sector of the Southern Ocean for further research and consideration for protection within the systematic-environmental geographic framework of the ATS.

Chapter 7 presents the final conclusion and recommendations of the study. A summary of the research outcomes is provided, and concluding remarks are linked back to the original research questions. Recommendations are made regarding whether- and how-ATCPs should consider international instruments and approaches in the ongoing development of the ATS. Importantly, the results of the case study provide a possible method by which areas can be prioritised and selected despite the limited knowledge on marine biodiversity. Areas for future research are identified.

The next chapter outlines how the research is approached, from a policy and science perspective, highlighting the relevance of the research and providing a brief review of the novelty of the approach taken here.



Chapter 2

2 RESEARCH DESIGN

2.1 An Assessment of International Instruments and approaches

This study examines possible strategies for high seas marine conservation in the Southern Ocean from both policy and science perspectives. The instruments of the ATS are considered and contrasted against selected international instruments and approaches to analyse how they apply to the Southern Ocean. In the light of that assessment, and given the paucity of data on Southern Ocean marine biodiversity, a quantitative analysis is undertaken using seabirds as surrogates for general marine biodiversity. The use of surrogates is one method that can assist in area selection and prioritisation and aid in the development of a MPA network in the Southern Ocean. Further explanation of the methodology behind these assessments follows.

The ATS and selected international instruments and approaches are outlined in the literature review with a specific focus on protective measures that might apply in the high seas or marine environment. Chapter 5 analyses how comprehensive each instrument or approach is in terms of:

- three primary conservation approaches: species, *in-situ* and *ex-situ* conservation
- the sense of stewardship and progressiveness, as measured by each instrument's possible application within marine or high seas areas, and their endorsement or adoption of the ecosystem and precautionary approach
- the level of global support and recognition of each instrument (entry into force and number of Contracting Parties)

The case study considers possible approaches for the prioritisation and selection of MPAs in the Southern Ocean. This is an important question given the paucity of data on most of the biological and physical components of the marine environment. The case study considers the potential use of at sea seabird sightings as surrogates for marine biodiversity in the Southern Ocean. Seabirds have been associated with areas of high biodiversity elsewhere, and can indicate the presence of other species, hence their potential value for designing protected areas (Dunn et al. 1999, Woehler et al. 2003).

2.2 The Use of Biodiversity Surrogates for Area Selection

When selecting areas for conservation action, particularly in the marine environment, decisions are typically made without full knowledge of the biodiversity of the region – more so than is the case for terrestrial regions. Accordingly, managers must prioritise areas for protection based on the best scientific knowledge and methods available. There is not yet agreement on the best means by which to prioritise areas for the conservation of biodiversity (Sarkar and Margules 2002).

One possible solution for the selection of areas for biodiversity conservation is the use of surrogates (Brooks et al. 2001, Gladstone 2002). The desired measure would need to be able to distinguish how biodiversity varies from place to place. Since we do not generally have a complete inventory of the biodiversity of an area, a relative measure – or surrogate – is used, which indicates general biodiversity trends (Sarkar and Margules 2002). Numerous studies have been undertaken on the application of surrogates for the selection of terrestrial and marine areas for protection (Faith and Walker 1996, Vanderklift et al. 1998, Ward et al. 1999, Margules and Pressey 2000, Reyers and van Jaarsveld 2000, Reyers et al. 2000, Roff and Taylor 2000, Zacharias and Roff 2000, Brooks et al. 2001, Cabeza and Moilanen 2001, Manson and Die 2001, Ferrier 2002, Garson et al. 2002, Gaston et al. 2002, Gladstone 2002, Margules et al. 2002, Sarkar et al. 2002, Sarkar and Margules 2002, Shackell and Kenneth 2003, BirdLife International 2004, Fleishman 2005). It is generally recognised that the use of surrogates will not capture all of the biodiversity in a region, since a surrogate by its very nature is only a component of the total biodiversity in the region. Therefore, areas selected using such methods will need to be protected as part of a wider conservation framework that includes both the ecosystem approach and ideally the precautionary approach (Margules et al. 2002). When using surrogates some thought needs to be given to the appropriate use of spatial scale. The scale needs to be small enough to be practical and large enough to identify the significance of the area via the surrogate measure (Garson et al. 2002). If the scale if too small then the surrogate may not be captured, but if the area is too large then variation may not be captured and the result may not be sufficiently discriminating.

Species richness (the number of different species, or biodiversity) is one possible surrogate for species diversity, however using species richness alone is unlikely to capture all the critical areas for conservation action since it will not differentiate among

areas with varied species compositions and distributions (Sarkar and Margules 2002), and may overlook endemic, rare or at-risk species (Brooks et al. 2001). For example, species richness will not differentiate between a site that contains two different species in low concentrations (e.g. two snow petrels and one Antarctic prion) compared with a site that contains two different species in higher concentrations (e.g. 40 snow petrels and 15 Antarctic prions). Complementarity uses either species richness or rarity to sort places by the number of unrepresented surrogates present and selects sites iteratively until all unrepresented species are covered (Garson et al. 2002). Complementarity, however, only tends to represent species distribution and not the processes that promote their persistence such as migratory patterns, pollination, predator-prey dynamics and resilience to climate change. Ideally, areas should be selected for their biodiversity in terms of species, habitats, biomes and other environmental variables (Sarkar and Margules 2002). There is some evidence to suggest that complementarity methods are efficient when the first step of site selection uses rarity and subsequent steps use richness (Garson et al. 2002, Sarkar and Margules 2002). Complementarity aims to identify a minimum set of sites, and does not take into account species concentrations.

Rarity is another possible surrogate whereby areas are selected because the species/features in one area are not present elsewhere. Protection of such sites is critical and needs to occur even in the event of economic trade-offs since the species or habitats occurring in such areas cannot be protected elsewhere (Margules et al. 2002). Other surrogates that could be used for area selection include focal species, which refer to flagship, umbrella, indicator or keystone species (Zacharias and Roff 2001). Flagship species are charismatic species that attract public support, the object of which is to gain protection of their habitat and associated species (examples in the Antarctic would be species such as emperor or chinstrap penguins). Umbrella species are wide-ranging species whose ranges overlap with other species' ranges – so conserving areas important to umbrella species may also conserve other species. Indicator species are those whose presence indicates the composition or conditions within specific habitats, communities or ecosystems (for example, CCAMLR uses indicator species to assess impacts on dependent and associated species within their CCAMLR Ecosystem Monitoring Program (CEMP) sites). Keystone species are those whose presence is critical to the ecological function of the community or habitat – in the Antarctic krill would be an

example of a keystone species. The use of focal species for area protection may not necessarily protect or capture all the components of biodiversity. However focal species can be useful in the classification, monitoring and assessment of areas and contribute to the subsequent selection of a set of representative and distinctive areas (Zacharias and Roff 2001).

Species at-risk can be used as a surrogate since they are a component of biodiversity. Garson et al (2002) completed a case study on the usefulness of breeding bird distributions as a surrogate for species at-risk (Garson et al. 2002). Garson et al.'s study (2002) considered a region in southern Québec that contained 402 species identified as at-risk. The study area was aggregated into 0.2° x 0.2° grids, 42 of which contained at-risk species but had no bird records. Using the breeding bird distributions only four of the at-risk species were not represented in the selected areas. The highest possible surrogacy of the bird data was 98.8%. Garson et al. (2002) also considered the representation of birds based upon conservation targets of one, five, 10 and 20 representations of birds. For example, for 10 representations of birds it would be necessary to preserve 10 populations of each species of bird in a system of reserves. With five representations of birds, 76% of at-risk species were covered, compared with 10 and 20 representations which encompassed 87% and 90% of at-risk species respectively (Garson et al. 2002). Brooks et al. (2001) examined the performance of 228 East African IBAs to ascertain their propensity to be important biodiversity areas for terrestrial vertebrate varieties (Brooks et al. 2001). In an assessment of all bird, mammal, snake and amphibian species in the areas, over 90% of terrestrial biodiversity was represented in the IBA network, although since the network was selected on the basis of the importance to birds, to some extent this would be expected (Brooks et al. 2001). The use of IBA criteria for the selection of areas is also effective as it incorporates ecological (migratory) processes. But whilst IBAs appear to be excellent in their coverage of vertebrates, mammals and birds, they may not capture important sites for vulnerable or threatened vertebrates since only sites of importance to birds are selected. It would therefore appear that birds can be effective surrogates for biodiversity, but that this approach should be part of a wider conservation approach (Brooks et al. 2001).

The use of complementarity and/or other approaches requires significant quantities of data and can be costly. Therefore this study seeks to undertake a preliminary analysis to

assess whether further research should be conducted and other sources or methods applied for the identification of priority conservation areas in the Southern Ocean. Examples of other surrogates that could be used for MPA selection could include, *inter alia*, fisheries catch data (Manson and Die 2001), surveys of pelagic or benthic species, seabird sightings, marine mammal sightings and environmental data[1]. The use of physical environmental data would also be of value. Fisheries data could be useful to identify spawning and/or nursery grounds for protection and the use of fisheries data may enable the identification of trends over time and the potential economic impact(s) of MPAs on fisheries (Manson and Die 2001).

The use of surrogates for the selection of MPAs in the Southern Ocean could be particularly useful as the knowledge and understanding of marine environment in the Antarctic is very limited. Some studies have found, however, that areas selected for the protection of just one taxonomic group are unlikely to cover all species present (Gladstone 2002). This study uses at sea seabird sightings as a surrogate for marine biodiversity. Birds are the most commonly used taxon for conservation planning, since they are widespread, diverse, easily surveyed and taxonomically well known (Brooks et al. 2001). However, a limitation of using bird observations is that birds are highly mobile and so may be somewhat less vulnerable to habitat fragmentation than other species, displaying a degree of adaptability to change (Garson et al. 2002). As a consequence, not all critical habitats and ecosystems will be detected by this approach. A study was conducted by Usher and Edwards considering the use of Anthropod fauna for the selection of terrestrial conservation areas but it appears that little similar work has been completed in the Antarctic (Usher and Edwards 1986). They found that diversity was not a useful measure for selection of conservation areas in the Antarctic since compared to the rest of the world, Antarctic terrestrial diversity is relatively low (Usher and Edwards 1986). Instead, Usher and Edwards suggested the representativeness and

[1] The wildlife on voyage dataset contains data on other species (seals and whales) and environmental data (Watts and Woehler 2003). Data on all fields were not necessarily collected over the thirty year period and as such the data can be patchy – it was beyond the scope of this study to assess these issues, but may be of interest for future research. The fields of interest include: Observation Date; Season; Temp Ship; Latitude; Longitude; Ship Speed; Ship Course; Seastate; Sea Temperature; Seaice; Visibility; Salinity; Depth; Cloud Cover; Precipitation; Windforce; Wind Direction; Air Temperature; Air Pressure; Icebergs; Ship Activity; Species Type; Species Code; Taxon Id; Bird Age; Distance; Species; Feeding; Sitting On Water; Sitting On Ice; Sitting On Ship; In Hand; Flying Past; Accompanying; Following Wake; Bird Direction; Swimming Past; Float In Water; Porpoising; Following; Surfacing; Breaching; Blowing; Move Thru Ice; Frolicking; Pod Number; Total Pods. These data may be of interest in future research that builds on the results presented here.

uniqueness appeared the most useful surrogate measures in the Antarctic. This study seeks to contribute to this debate by considering appropriate measures in the marine environment.

2.3 Seabirds as Surrogates for Southern Ocean Marine Biodiversity

The Australian Antarctic Division (AAD) provided access to a dataset entitled 'Wildlife on Voyage', covering most seasons between 1977/78 and 2001/02 (Watts and Woehler 2003). The database comprised 137,417 records of seabird at sea sightings of collected during marine research or Antarctic station resupply voyages. The study area for this research was the area south of 40°S to the Antarctic and between 45°E and 160°E, where the majority of observations were made (n = 136,052 records). Instances where the observer was unable to confidently identify the species or where sightings were considered dubious were excluded from the analysis[2]. Data from the 1982/83 season were excluded from all analyses as a different observational methodology was used (Woehler 1997). Full details of the observational methodologies have been described elsewhere (Woehler 1995, 1997).

To check for possible effects of spatial scale the data were binned into three arbitrarily chosen bins sizes[3] of 1° latitude x 1° longitude (n = 1952 records), 2° latitude x 2° longitude (n = 704 records), and 5° latitude x 5° longitude (n = 177 records) (henceforth described as 1 degree, 2 degree and 5 degree bins). At each scale, four potential indices or measures were created to assess whether the data could be used as a surrogate for marine biodiversity in the Southern Ocean. These were:

Density: the abundance of seabird species (i.e. total [number of] all seabird species observed)

Richness: the number of individual seabird species (also known as seabird species diversity)

IUCN: abundance(s) of EN or VU seabird species (as per IUCN conservation status; http://www.redlist.org, as at November 2004)

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[2] Records excluded were: "great" albatross; "mollymawk" albatross sp.; albatross sp.; Arctic/Antarctic tern; blue petrel/prion spp.; brown noddy; cookilaria petrel; Cory's shearwater; diving petrel sp.; *Fregetta* storm petrel; giant-petrel sp.; grebe sp.; gull spp.; Identified but not listed; jaeger sp.; Madeiran storm petrel; noddy sp.; Australasian gannet; parasitic jaeger; penguin sp.; petrel sp.; prion sp.; royal albatross sp.; shearwater sp.; skua sp.; storm petrel sp.; tern sp.; tropic bird species; unidentified bird

[3] A similar approach was used by Raymond B, Woehler EJ (2003) Predicting seabirds at sea in the Southern Indian Ocean. Marine Ecology Progress Series 263:275-285 for selection of spatial bin size.

Shannon-Weaver: a measure that combines seabird species density and diversity[4], based on information theory

The formula used for the calculation of the Shannon-Weaver diversity index is:

$$H' = -\sum_{i=1}^{s} (p_i * \ln(p_i))$$

H' = Index of species diversity
s = Number of species
p_i = Proportion of total sample belonging to ith species

For each bin, the number of surveys (measured in 10 minute observation periods)[5] and the area[6] surveyed (km^2) were measured. The four surrogate values within each bin were fractioned as a proportion of the surveys undertaken and the area per bin (e.g. density per survey per km^2) and then normalised between 0 and 1.

The Mantel Test uses the Pearson Correlation Coefficient to measure the strength of the relationship between two symmetric matrices of association. This test is useful to assess whether the four surrogates (Matrix A = Density; Richness; IUCN and Shannon-Weaver) have any relationship to location or distance (Matrix B). The surrogate matrices were created by measuring the Euclidian Distance between grid cell centres (Manly 1997), whilst the distance matrices were geographical distance between cell centres (latitude and longitude). If the matrix pairs show a similar trend, bins with similar counts tend to occur close to each-other so spatial correlation of seabird diversity (for example) is suggested.

[4] The Shannon-Weaver Diversity Index, although still often used, has come under a degree of criticism (e.g. Austin MP (1999) A silent clash of paradigms: some inconsistencies in community ecology. Oikos 86:170-178). It is presented here as one possible approach that may be able to be used for spatial analysis and decision-making. The Shannon-Weaver Diversity Index is sometimes incorrectly referred to as the Shannon-Weaner Diversity Index.

[5] Some bins were visited - and hence surveyed - more often than others so the effect of survey effort must be removed.

[6] The size of the bins differs with the cosine of the latitude, so the effect of latitude must be removed (at 40°S, a 1 degree bin is approximately 9400km^2, while at 70°S it is 4140km^2).

$$A = \begin{bmatrix} 0 & a_{21} & \cdots & a_{n1} \\ a_{21} & 0 & \cdots & a_{n2} \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & 0 \end{bmatrix} \quad B = \begin{bmatrix} 0 & b_{21} & \cdots & b_{n1} \\ b_{21} & 0 & \cdots & b_{n2} \\ \cdots & \cdots & \cdots & \cdots \\ b_{n1} & b_{n2} & \cdots & 0 \end{bmatrix}$$

The Mantel Test measures the observed correlation and then randomly reshuffles the observations to arrive at the randomised distribution. The original results are then compared with the randomised results to test the level of significance (Manly 1997). The formula used for the Mantel Test is:

$$r = \frac{\Sigma a_{ij} b_{ij} - \Sigma a_{ij} \Sigma b_{ij}/m}{\sqrt{[\{\Sigma a_{ij}^2 - (\Sigma a_{ij})^2/m\}\{\Sigma b_{ij}^2 - (\Sigma b_{ij})^2/m\}]}}$$

$$m = n(n-1)/2$$

If the level of spatial correlation is high, then observations that are spatially proximate display more similarity than those taken at greater distances. Alternatively, high spatial correlation indicates a relationship between the bin location and diversity characteristics.

The data were first processed and mapped in ArcView 3.3, a Geographical Information System (GIS) software from ESRI (Environmental Systems Research Institute, Incorporated, see www.esri.com, cited 12 January 2006). The surrogates were mapped for each of the three bin sizes and classified into three classes using equal area classification which allocates approximately the same number of bins in each class. For each spatial scale the bins that were classified as "High" in each of the four surrogate measures were identified as high conservation value areas and mapped. The spatial bins that appeared as high conservation value areas in all three bin sizes were isolated and mapped at a scale of 1 degree as the spatial bins that represent the highest priority areas in terms of their conservation potential.

Cluster analysis was performed on the data to test for consistency with the GIS classification process. The cluster analysis classified the spatial bins on the basis of the four surrogate measures. Five groups of bins were selected to summarise the classification. The bins in each group are expected to have a similar profile based upon the values of each of the four surrogates.

The Bray - Curtis Dissimilarity Coefficient was selected as the method of estimating the level of association between bins. With this measure, bins with similar high diversity values are given more weight than bins with similar low diversity values (Bray and Curtis 1957). The 1 degree bin dataset used the non-hierarchical allocation software package ALOC to produce the five groups (Belbin 1987). For the smaller datasets of 2 degree and 5 degree it was possible to use hierarchical clustering to cluster the data into five groups (Belbin et al. 1992). The maps produced from these analyses are presented in Appendix 4.

2.4 Summary

Understanding how to approach Southern Ocean marine conservation from a policy perspective, both within the context of the ATS and subsequently under other instruments and approaches, is essential prior to developing any system of MPAs. This is undertaken in Chapters 3 and 4, followed by a more detailed assessment of how conservation may be approached from a policy perspective in Chapter 5. The linkage from a theoretical (or policy) perspective to implementation of a systematic and representative system of Antarctic MPAs (which must be the foundation of any marine conservation strategy) must also be considered. The case study is presented in Chapter 6, and is a preliminary exploration of how the problem of selecting candidate high seas areas for conservation action(s) may be approached, particularly when considering given the lack of full-scientific knowledge on the marine environment.

Chapter 3

3 THE RISE OF GLOBAL CONSERVATION

3.1 The Global Resource Crisis

The world's natural resources have been explored and exploited by the global population as though they were inexhaustible. It is now recognised that there is a global resource crisis, and that as the world's population grows so too does the pressure on natural resources (Bergin and Haward 1995). Conservation initiatives have traditionally been reactive, not proactive, so as a rule conservation action was taken after environmental damage had already occurred. The environmental consequences of human activities have been harsh and in many cases, unforeseen. Examples include acid rain, climate change, coral bleaching, ozone depletion, accelerated species' extinctions and endangerment, introduction of alien species, although the extent to which some such events are natural as opposed to anthropogenic remains in contention (UNEP 2002). Despite the growing global awareness that many of our actions are detrimental to the environment, in many cases conservation is only implemented if a risk or threat to the species, area or ecosystem is evident.

Recently the precautionary principle has emerged within conservation thinking. The precautionary principle (or precautionary approach)[1] calls upon States to exercise prudent foresight and consider undesirable outcomes at all stages of the planning process (FAO 1996). In the past it was necessary to prove that human activities were having a harmful impact on the environment in order to implement protective measures. Conversely, the precautionary principle assumes that human actions are harmful unless proven otherwise – hence reversing the burden of proof (Rothwell 1990, FAO 1996, Bohnsack et al. 2000). Furthermore, scientific uncertainty or the lack of scientific proof should not prevent the protection or conservation of resources.

[1] The term 'precautionary principle' generally refers to the formal term/concept that was developed as part of the 1987 World Commission on Environment and Development. For the purposes of this research, generally the term precautionary approach is used, and refers to applications/instruments that either explicitly use the term 'precautionary principle', or whose measures are precautionary in nature (even if not explicitly referred to as such in the text). For example, any measures that encourage prudent foresight in the absence of full scientific knowledge.

International instruments have also emerged to manage conflicting uses of resources that may have many values for varying stakeholders. These values could include economic, research, scientific, wilderness, aesthetic, tourist, recreational, environmental (e.g. biodiversity, ecosystem management), cultural and historic values. Conservation approaches can generally be aligned with three major categories: species, *in-situ* and *ex-situ* conservation. Overarching these is the notion of stewardship, and the application of the precautionary approach and ecosystem approach. Table 3.1 summarises the conservation approaches that apply within this framework. These categories are not mutually exclusive, and it is common for instruments and approaches to adopt measures to address many, if not all of these objectives. There is now widespread acknowledgment of the need for a multi-faceted approach to conservation; however the uptake and implementation of marine conservation has lagged behind terrestrial conservation.

Table 3.1 Conservation Approaches

Species	*In-situ*	*Ex-situ*
Protection Management Monitoring By-catch mitigation	Area protection and management Ecosystem protection Habitat protection Prevention of alien introductions Guidelines and criteria for protection Promote compatible land-uses	Research and development Cooperation Specimen collection Conservation training and education Species recovery and rehabilitation Captive breeding
Stewardship Political will and legislative force Stakeholder engagement and accommodation of indigenous land-uses Provision of resources locally and to developing States (financial and other) Public education and advocacy		
Precautionary Approach		
Ecosystem Approach		

Conservation approaches are usually implemented within the framework of local, regional or global instruments that govern human behaviour to protect and sustain the natural environment. Instruments vary in terms of the obligations placed on the signatories. Soft law instruments are not legally binding; instead signatories voluntarily agree to follow the provisions of the instrument in question. Examples of soft law are guidelines, codes of conduct and recommendations (such as the United Nations General Assembly Recommendations, Agenda 21, and the Code of Conduct for Responsible Fisheries). Soft law instruments often form the foundation of hard law instruments, particularly if they have been in place for some time and become customary law, such as was the case with LOSC. Hard law instruments are legally binding on signatories once in

force, so any breaches are liable to legal action by other States. Entry into force depends upon ratification by signatories, which requires that State signatories must demonstrate their legal commitment to the provisions of the instrument by enacting its measures within national policy.

3.2 The Development of Area Protection

3.2.1 The World Conservation Union and United Nations Environment Programme

Area protection is the most widely recognised and adopted conservation technique and is considered to be a leading means of protecting biodiversity *in-situ* (Green and Paine 1997). As described in Chapter 1, protected areas can comprise both terrestrial and marine areas. The IUCN's World Commission on Protected Areas (WCPA) and Protected Areas Programme (PAP) aim to "promote the establishment and effective management of a world-wide representative network of terrestrial and marine protected areas" (IUCN WCPA 1999). Together with UNEP the IUCN works towards the development of international protected area networks, laws, programs and organisations for the protection of the environment. The IUCN promotes the inclusion of a protected area system within international, regional, national and local legal frameworks, either incorporated into a pre-existing protected area framework or via the establishment of a new protected area framework. The IUCN has created a universal classification of areas into one of six categories to be applied to any ecosystem or area (see Table 3.2)[2].

Table 3.2 IUCN Protected Area Classifications

IUCN Category	Description
I – Strict Nature Reserve/Wilderness Area	Ia - Strict Nature Reserve: A protected area managed mainly for science Ib - Wilderness Area: A protected area managed mainly for wilderness protection
II – National Park	A protected area managed mainly for ecosystem protection and recreation
III – Natural Monument	A protected area managed mainly for conservation of specific natural features
IV – Habitat/Species Management Area	A protected area managed mainly for conservation through management intervention
V – Protected Landscape/Seascape	A protected are managed mainly for landscape/seascape protection and recreation
VI – Managed Resource Protected Area	A protected area managed mainly for the sustainable use of the natural ecosystem

Source: (www.iucn.org/themes/wcpa/ppa/protectedareas.htm, cited March 2006)

[2] Details of each classification can be found in IUCN (1994) Guidelines for Protected Area Management Categories, IUCN, Gland, Switzerland and Cambridge, UK.

Marine Protected Areas

Although the IUCN definition of protected areas facilitates the protection of both terrestrial and marine areas, terrestrial protection to date has been more widely adopted. The marine environment has been overlooked for a variety of reasons. The logistic challenges and resource intensive nature of data collection and analysis in the marine environment have contributed to the lagging evolution of conservation in the marine realm. This is particularly true for the high seas and the Southern Ocean, which can be subject to extreme environmental conditions. Consequently, marine scientists still have much to learn and discover about the marine environment (Kimball 2001).

Marine living resources had been viewed by some as being infinite; overfishing and fishery collapses have, however, clearly demonstrated that this is not the case (De Fontaubert et al. 1996, Caddy and Cochrane 2001). High seas fisheries presently represent between 10-20% of global catch (De Fontaubert et al. 1996, Gjerde and Breide 2003). The high seas are traditionally viewed as global commons and are subject to a greater risk of over-exploitation, particularly as resources of marine areas under national jurisdiction are in decline. Furthermore, countries with limited or no access to marine areas have little choice but to fish in international waters. Pressure on high seas resources has been further exacerbated by the extension of national jurisdiction introduced by the changes in LOSC via the application of Exclusive Economic Zones (EEZ) (see later section), which led to fisheries displacement. These factors have contributed to increased pressure on marine resources both within and beyond national jurisdiction (Kimball 2001).

Overfishing is not the only threat to the marine environment. Since the world's oceans are interconnected, activities that occur in any region have the potential to have downstream impacts in other regions, as evidenced by the bioaccumulation and discovery of persistent organic pollutants (POPs) in marine living resources in polar regions (UNEP 1999, Kimball 2001). Other factors that affect the balance of the marine environment include tourism (particularly around coastal regions), marine pollution - with pollution from land-based sources comprising an estimated 70% of all marine pollution (De Fontaubert et al. 1996, UNEP 2002), climate change which threatens to upset marine ecosystem dynamics (e.g. coral bleaching), biodiversity loss, unknown impacts from bio-prospecting, research, exploration and exploitation (UNEP 1999).

Evidence that the world's oceans are under excessive pressure and at risk of collapse instigated an international movement towards marine protection (UNEP 2002), but this has been limited to areas within national jurisdiction. Transboundary marine reserves are rare but are increasingly being raised as a solution for marine conservation (IUCN 1998). An example of such international cooperation applies to the Wadden Sea, an area known for its species richness and diversity (Enemark et al. 1998, Enemark 2005). Denmark, Germany and the Netherlands collaborated to create a transboundary marine protected area that extends to cover the migratory path of 10 to 12 million birds (Enemark et al. 1998). The introduction of marine protection has not been without its challenges. Marine areas are difficult to define and delineate, and place great challenges on managers who are faced with the difficult task of monitoring and enforcement (Caddy and Cochrane 2001). The international community has been grappling with this via attempts to address IUU fishing that occurs both within and beyond national jurisdiction (Tasker et al. 2000, Ward et al. 2000, Anon 2003).

The development of MPAs has been somewhat *ad-hoc* and has not yet resulted in a worldwide representative system of MPAs. Recognising this, in 1995 the IUCN published a global representative system of marine protected areas, a four volume project that assessed the global status of MPAs and made recommendations on the future requirements necessary to achieve a truly representative system of MPAs (Kelleher et al. 1995a, b, c, d). These reports confirmed the need to improve and develop a more systematic approach to MPA design – and highlighted that although the Southern Ocean is not subject to the same pressures and threats as other regions[3] (see also Constable 2004), there is currently insufficient protection of the Southern Ocean via the designation of MPAs.

3.3 Key International Instruments and Conservation Approaches

Each international instrument and approach is subject to varying provisions that seek to protect or manage the natural environment and its resources. The focus of this research

[3] The Antarctic does not have a permanent population, so many of the pressures associated with population growth/urbanisation (e.g. land clearing, pollution) which is concentrated in coastal regions, do not apply on a large-scale in the Antarctic. CCAMLR manages commercial fishing activities at very conservative levels via adoption of precautionary catch limits – a significant achievement considering that around 75% of the world's oceans are fully fished, over-fished or recovering (Gjerde 2003). It is worth noting, however, that the Southern Ocean is subject to high levels of illegal, unreported and unregulated fishing activities which threaten to undermine the effectiveness of precautionary catch limits (CCAMLR Commission 2004).

is on mechanisms by which the Southern Ocean marine environment, much of which is high seas, can be protected. Relevant approaches will be reviewed in the following section, with particular emphasis on provisions that might apply to the marine environment. The instruments and approaches are considered in chronological order of the date that the instruments were signed.

3.3.1 The International Convention for the Regulation of Whaling (1946)[4]

Historically, global whaling activities saw the steady depletion of whale stocks, leading to the formulation of the ICRW, which developed from the 1937 International Agreement for the Regulation of Whaling and its various protocols. The ICRW aims to conserve whale stocks and manage whale fisheries. The ICRW was opened for signature to any State on 02 December 1946, and entered into force on 10 November 1948. There were 66 Contracting Parties as at March 2006. The ICRW is of relevance to the Antarctic as many whales migrate through Southern Ocean waters. The Southern Ocean Whale Sanctuary is also managed under ICRW.

The Schedule to the ICRW contains measures for the conservation and rational use of whale resources (Article V.1), and includes the following measures for species, *in-situ* and *ex-situ* conservation:

a) Protected and unprotected species
b) Open and closed seasons
c) Open and closed waters, including sanctuary designation
d) Species' size limits
e) Time, methods and intensity of whaling (including seasonal catch limits)
f) Gear specifications
g) Measurement methods
h) Catch records and other data collection
i) Methods of inspection

The killing, capture and treatment of whales for scientific purposes is allowed with a permit subject to certain conditions (Article VIII.1). Whales taken for scientific purposes should be processed as much as practicable to minimise waste, and research outcomes circulated (Article VIII.1). The ICRW encourages systematic observation and

[4] 161 UNTS 74, 82

collection of biological data on whales to improve and assess management practices, and Contracting Parties have a duty to submit annual reports to the International Whaling Commission (IWC) regarding their whaling activities (Article VIII). Contracting Parties have an obligation to monitor and impose punishments on their nationals where they do not comply with the measures of the ICRW, including reporting infractions to the IWC (Article IX.1, 2 and 3).

Whaling for commercial purposes is forbidden, except for minke whales (*Balaenoptera acutorostrata*) (Section III.6). Two Whale Sanctuaries have been created within which commercial whaling is prohibited: the Indian Ocean Whale Sanctuary (designated in the Schedule, Section III.7a), and the Southern Ocean Whale Sanctuary (designated in the Schedule, Section III.7b). Additionally, two new whale sanctuaries have been proposed. Australia submitted a proposal in 2000 to establish a South Pacific Whale Sanctuary, and in 2001 Brazil and Argentina proposed a South Atlantic Whale Sanctuary. Both proposals have failed to achieve the two-thirds majority required for adoption, but have nonetheless received majority support (Department of Environment and Heritage 2004). The Schedule contains detail regarding open and closed seasons for both ships and land based whaling operations. Whale stock is classified either as Sustained Management Stock; Initial Management Stock; or Protected Stock and each classification is subject to specific stock levels and measures. Whilst commercial whaling is permitted on Sustained and Initial Management Stocks within certain controls, no commercial whaling is allowed on Protection Stocks (see Section III.10 for more detail).

The IWC was established under Article III to encourage research into whaling; data collection and analyses, and circulation of information pursuant to increasing whale stock levels (Article IV.1). The IWC can propose amendments to the Schedule where they promote the objectives of the Convention and only if they are based upon scientific findings (Articles V.1 and V.2). The IWC comprises one member from each Contracting Party who has one vote (Article III.1). The IWC makes decisions based upon a simple majority vote, however any decisions relating to the amendment of the Schedule pursuant to Article V must have a three quarter majority (Article III.2). Contracting Parties may lodge an objection to proposed amendments to the Schedule, and providing this objection is lodged within a set timeframe that amendment does not apply to the objecting Contracting Party (Article V.3).

Status, Evolution and Analysis

The ICRW does not apply the ecosystem or precautionary approach. Dependent and associated species are not protected or considered in the Convention and no overt consideration is given to the food requirements of whales (except perhaps via whale sanctuaries). The ICRW and Whale Sanctuaries do not address other threats, such as pollution, habitat degradation and loss, introduced species and global climate change (Gerber et al. 2005), and States Parties to the ICRW can make a reservation to a sanctuary, as Japan has done, so restrictions on activities do not apply. Also, measures are insufficient to protect whales once they migrate out of the Sanctuaries across long distances in unprotected waters. Although commercial whaling is prohibited, permits may be issued for scientific research providing that any whales taken are fully processed to minimise waste – a provision that enables States to sell commercial whale products legitimately. No quotas or area restrictions apply for scientific whaling other than those imposed on nationals by the issuing government (Gerber et al. 2005). The IWC can amend the Schedule (e.g. open/closed seasons, areas and protected species), thus potentially protection of dependent and associated species could be incorporated. However amendments must be based upon scientific findings[5], Parties can lodge an objection to the amendment (and hence may not be bound by it) and decision-making in the IWC depends upon a two-thirds majority vote. Furthermore, any changes made to the Schedule cannot restrict or impose quotas on specific factory ships, land stations or the number and nationality of those users, and should consider the interests of consumers of whale products and the whaling industry (Article V.2). These are key issues that impede the effectiveness of the ICRW in the conservation and rational use of whale stocks.

3.3.2 UNESCO's Man and the Biosphere Programme (1970)

The MAB Programme was launched in 1970 following the 1968 UNESCO Biosphere Conference (UNESCO 1995, 2003d). Biosphere Reserves are internationally recognised terrestrial or coastal ecosystems that represent a living example within which to test and demonstrate techniques for managing land, water and biodiversity with the objectives of conservation and sustainable use. The MAB Programme aims to identify and protect a coordinated, systematic and representative network of the main ecosystems of the world

[5] The paucity of data on marine mammals and their environment poses a further challenge in this regard.

under the Programme, whilst accommodating community interests and participation (UNESCO 1995, 2003d).

Biosphere Reserves are nominated by States for sites within their jurisdiction (UNESCO 1995, 2003d). There are 482 biosphere reserves already nominated in 102 countries globally as at March 2006, including seven transboundary reserves (UNESCO 2003e). Of these, 76 Biosphere Reserves are partially or wholly Ramsar listed sites (UNESCO 2003a), 54 Biosphere Reserves are partially or wholly World Heritage listed sites (UNESCO 2003c), and 17 are either wholly or partially listed on both the Ramsar List and the WHC List (UNESCO 2003b). Sites must meet set criteria and fulfil three functions to be designated as a Biosphere Reserve (UNESCO 1995, 2003f, d), as outlined in Box 3.1:

Biosphere Reserves must comprise a core, buffer and transition zone, and each zone may be subject to different management activities. Landscapes, ecosystems and species within core areas must be formally protected under national legislation, and be large enough to meet the conservation objectives of the site. Human access within the core zone is only permitted for scientific monitoring or research, or to allow for traditional indigenous uses. The buffer zone should surround the core area(s) and allow land-uses that do not jeopardise the integrity or conservation objectives of the core zone. The transition zone surrounds the buffer area(s) and may accommodate various land-uses such as agriculture and housing whilst providing for sustainable management of the natural resources of the region (UNESCO 1995, 2003d).

Box 3.1 Functions and Criteria of Biosphere Reserves

Functions

- Conservation: "to contribute to the conservation of landscapes, ecosystems, species and genetic variation;"
- Development: "to foster economic and human development which is socio-culturally and ecologically sustainable;"
- Logistics: "to provide support for research, monitoring, education and information exchange related to local, national and global issues of conservation and development."

Criteria

The proposed area should:

- be representative of a major biogeographic region, including a gradation of human intervention in these systems;
- contain landscapes, ecosystems or animal and plant species, or varieties, which need to be conserved;
- provide an opportunity to explore and demonstrate approaches to sustainable development within the larger region where they are located;
- be of an appropriate size to serve three functions of biosphere reserves mentioned above;
- have an appropriate zoning system, with a legally constituted core area or areas, devoted to long-term protection; a clearly identified buffer zone or zones and an outer transition area

(UNESCO 2003f, d)

Status, Evolution and Analysis

The Biosphere Reserve concept has been in operation for 35 years, and has developed substantially over this period due to its adaptive management approach. The Seville Strategy for Biosphere Reserves encourages the implementation of international agreements promoting conservation and sustainable development; the development of a representative network of sites; and greater research, training and cooperation in establishing and managing Biosphere Reserves (UNESCO 1995). In particular, the Seville Strategy highlighted deficiencies in coastal and marine networks that need to be addressed. The Seville Strategy emphasises and reinforces the principles and objectives of the CBD and Agenda 21 (UNESCO 1995). Particular reference is made to developing protected area corridors and Biosphere Reserve/protected area connectivity, linking *in-situ* and *ex-situ* conservation programs. The Seville Strategy's Statutory Framework outlines criteria and processes for designation and the rules for defining the network of Biosphere Reserves. States are encouraged to elaborate and implement national criteria for Biosphere Reserves which take into account the local conditions (UNESCO 2003f).

The Biosphere Reserve concept has a number of strengths: it allows the zoning of reserves to accommodate multiple-use; is internationally recognised and widely adopted; site designation is pragmatic; proposed Biosphere Reserves must meet set criteria; and the core zone must be formally protected under national legislation. The MAB program promotes the concept of conservation and sustainable use, which is consistent with some of the objectives of the ATS, and in particular, CCAMLR.

The application of the Biosphere Reserve approach in the Antarctic was first raised in 1984 by the SCAR and the IUCN (IUCN 1991) and has been explored by several scientists (Rothwell 1990, Lewis Smith et al. 1994, Clark and Perry 1996, Kakabadse 2000, Wratt 2000). Although Biosphere Reserves have been successfully applied in the Arctic (CAFF et al. 1999), the application of the Biosphere Reserve concept in the Antarctic is hindered by territorial ambiguity which presents challenges in application. The development of transboundary reserves (Fall et al. 2003) demonstrates the commitment of States to engage in cooperative projects to protect important areas sharing common boundaries. It is not impossible to consider that ATCPs could reach

some sort of agreement on how such a system might be applied in the Antarctic, but this would be subject to sufficient political will.

3.3.3 The Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971)[6]

Ramsar was negotiated due to global concerns in the 1960s that human activities were having devastating effects on wetlands, which were recognised as having "economic, cultural, scientific and recreational value" and for their role in regulating water regimes and supporting habitats of fauna and flora (preamble). The Ramsar Convention was signed on 02 February 1971 and entered into force on 21 December 1975. There were 150 Contracting Parties to Ramsar in March 2006. The Ramsar List currently comprises 1,591 sites comprising 134.1 million hectares (http://www.ramsar.org, cited March 2006). There are currently no Ramsar listed sites in the Antarctic, however Australia submitted a proposal to designate Macquarie Island as a Ramsar listed site in 2004 (http://www.abcnews.net.au/tasmania/news/200406/s1122039.htm, cited 05 January 2005).

The Convention encourages Contracting Parties to designate wetlands of international importance within their area of jurisdiction for inclusion on the "List of Wetlands of International Importance" (Article 2-1). Parties are obliged to identify and designate at least one site for inclusion on the List. Potential sites are identified by Contracting Parties, either independently for sites within national jurisdiction or cooperatively for transboundary sites and/or shared water systems (Articles 2 and 5). To assist in the identification and prioritisation of potential Ramsar sites, the Conference of the Parties (COP) developed Criteria for Identifying Wetlands of International Importance (COP Resolution IV.2, see Table 3.3).

Amongst the measures outlined in Ramsar, Contracting Parties are encouraged to establish nature reserves on wetlands, even those not Ramsar Listed, and provide for the conservation and wise use of all wetlands and migratory waterfowl (Articles 4-1, 2-6 and 3-1, respectively). Where a listed site experiences a change in ecological character, Contracting Parties must notify other Parties and the Ramsar Bureau. In such cases a wetland may be delisted or altered, however Parties are encouraged to compensate for

[6] TIAS 11084

Table 3.3 Criteria for identifying Wetlands of International Importance

Group A – Sites containing representative, rare or unique wetland types	
Criterion 1	...contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
Group B - Sites of importance for conserving global biological diversity	
Criterion 2	...supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
Criterion 3	... supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
Criterion 4	...supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
Criterion 5	...regularly supports 20,000 or more waterbirds.
Criterion 6	...regularly supports 1% of individuals in a population of one species or subspecies of waterbird.
Criterion 7	...supports a significant proportion of indigenous fish subspecies, species or families, life history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.
Criterion 8	...important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

(COP Resolution IV.2)

any loss by the designation of or extension to another wetland (Article 4-2). Contracting Parties have additional duties for *ex-situ* conservation and stewardship via research, training, data exchange and species/wetland maintenance and restoration (Article 4). Sites do not necessarily have to be formally protected at a national level as their inclusion in the List recognises their intrinsic values and the need to monitor them and account for them in their conservation planning (Article 2-6 and Article 3).

Proposals for new sites are assessed by the Ramsar Bureau, which was established by a two-thirds majority vote of Contracting Parties (Article 8). The COP is convened by the Ramsar Bureau and held at least every three years to fulfil the requirements outlined under Article 6. The COP is a forum to discuss alterations to the List and seek input from relevant international bodies, organisations and Contracting Parties regarding implementation of and measures for the conservation and wise use of wetlands and their flora and fauna. The COP makes recommendations based upon this information, which Parties have a duty to consider in their conservation planning process (Article 6). Any Contracting Party may propose an amendment to the text of Ramsar however all amendments must be adopted by a two-thirds majority (Article 10 bis).

Status, Evolution and Analysis

The Ramsar vision and objectives are detailed in the strategic framework and guidelines for the future development of the List of Wetlands of International Importance (Ramsar COP Resolution VII.11 1999). A systematic approach to site identification and

prioritisation is encouraged, and sites from each biogeographic region should be designated. Coverage should include regional, international and transboundary sites, hence international and interagency cooperation is necessary (Ramsar COP Resolution VII.11 1999). Objective 4 of the strategic framework promotes collaboration and consistency with other international environmental instruments including, *inter alia,* the CBD and WHC. The strategic framework emphasises that although there are specific guidelines for waterbirds and fish species, wetlands may be identified for the protection of other wetland species (Ramsar COP Resolution VII.11 1999, Annex - para. 38). Contracting Parties should protect biologically diverse sites to maximise their conservation value.

Ramsar provides rigorous, quantitative criteria that sites must meet to be designated on the Ramsar List. The Ramsar Convention takes a multi-tiered approach in the protection of wetlands and dependent species, and is an early example of the trend towards an ecosystem approach for conservation, since it recognises the interdependencies between waterbirds and their environs. The significance placed upon other treaties, agreements and organisations reflects a trend towards international cooperation for environmental protection and recognition that activities at a local and national level can have impacts beyond national jurisdiction (see Ramsar COP Resolution VII.11 1999 - Annex, para's 11-15).

The designation of Ramsar sites in the Antarctic (in coastal or subantarctic locations) could be a contentious issue particularly with the ambiguity of territorial claims in the region, although it has been tabled on more than one occasion for discussion (Lewis Smith et al. 1994, Kakabadse 2000, Ramsar COP9 2005). The obligation to cooperate in areas of shared water systems applies to areas within State jurisdiction and does not necessarily apply to the high seas, although there is no clear definition of what "shared jurisdiction" actually means in the context of the Ramsar Convention. Flag-State responsibility could reasonably be applied to the high seas whereby Parties to Ramsar impose a duty on their nationals for the conservation of areas within and beyond national jurisdiction. Article 5 could also be interpreted to infer that areas should be managed on the basis of ecological, not political boundaries, hence promoting the ecosystem approach. The principles of Ramsar, however, do not necessarily require a site to be formally designated on the List, or even formally protected. Therefore, in the

case of the Antarctic it is not necessary to formally designate and/or protect sites in order to promote their conservation and wise use consistent with the objectives of Ramsar.

3.3.4 The World Heritage Convention (1972)[7]

The WHC was signed on 23 November 1972, and entered into force on 17 December 1975. There were 181 signatories to the WHC in March 2006. The objectives of the WHC are the protection of cultural and natural sites of outstanding universal value (Articles 1 and 2), and each Contracting Party has a duty to identify and delineate sites of outstanding universal value within its territory (Article 3). In the three decades since its inception, there are 812 listed sites covering 137 Contracting Parties (as at March 2006): 628 cultural; 160 natural and 24 mixed (http://whc.unesco.org/en, cited March 2006).

The definition of properties of natural heritage is detailed in Article 2, which facilitates site identification for pragmatic reasons (for example, geological values or to protect threatened species), but also for less tangible values such as aesthetic values (for example, wilderness values or natural beauty):

> natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view; geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation; natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty (Article 2).

States Parties must ensure "the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage...situated on its territory" (Article 5). Parties to the WHC must undertake research, education and training, monitoring and reporting to the General Conference (Articles 5 and 29). States also have a duty under Article 5-d to take appropriate legal, scientific, technical, administrative and financial measures to implement the objectives of the Convention.

States Parties acknowledge their responsibility of stewardship of sites of universal value, and the WHC promotes international cooperation in the identification of potential sites, as well as their protection, conservation, presentation and rehabilitation (Articles 6 and

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[7] 27 UST 37

7). Only sites meeting set criteria established by the Intergovernmental Committee for the Protection of the Cultural and Natural Heritage of Outstanding Universal Value (the Committee) may be designated (Article 11-2 and 11-5, see Box 3.2). Sites may be nominated only with the consent of the sovereign State, and where disputes over territorial sovereignty exist, the WHC shall in no way prejudice the rights of Contracting Parties involved in the dispute (Article 11-3).

Box 3.2 Criteria for World Heritage Listing on Natural Values

Paragraph 44 (a)

(i) be outstanding examples representing major stages of earth's history; or

(ii) be outstanding examples representing significant ongoing ecological and biological processes in... terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals; or

(iii) contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance; or

(iv) contain the most important and significant natural habitats for *in-situ* conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation;

And

Paragraph 44 (b)

(i) Sites meeting criteria 44(a)(i) should contain all or most of the key interrelated and interdependent elements of their natural relationships.

(ii) Sites meeting criteria 44(a)(ii) should have sufficient size and contain the necessary elements to demonstrate the key aspects of processes that are essential for the long-term conservation of the ecosystems and the biological diversity they contain.

(iii) Sites meeting criteria 44(a)(iii) should be of outstanding aesthetic value and include areas that are essential for maintaining the beauty of the site.

(iv) Sites meeting criteria 44(a)(iv) should contain habitats for maintaining the most diverse fauna and flora characteristic of the biographic province and ecosystems under consideration.

(v) All sites should have a management plan and a strategy for implementation of the plan. If not, the nominating State Party must demonstrate how they intend to prepare and resource the plan.

(vi) All sites must have adequate long-term legislative, regulatory, institutional or traditional protection. The boundaries of that site should reflect the spatial requirements of habitats, species, processes or phenomena that provide the basis for its nomination for inscription in the World Heritage List. Sites should also have a buffer in the adjacent area to protect the values of the site. Boundaries may coincide with one or more existing/proposed protected areas, and may contain one or more management zones. Only one of these zones must meet the criteria in paragraph 44(a).

(vii) All sites must be the most important sites for the conservation of biological diversity.

Source: (UNESCO 2002)

The Committee has the responsibility of administrating the operational aspects of the WHC, reviewing and assisting with site identification, prioritisation and listing; providing assistance to Contracting Parties (financial and other); and for publishing the List. Importantly, the Committee also has the duty to liaise with and invite comments from other organisations, States or individuals (such as the IUCN) with similar aims to the WHC regarding implementation of the Convention (Articles 8-3 and 13-7). All decisions of the Committee are made based upon a two-thirds majority vote (Article 13-8). Amendments to the text of WHC are permitted (including replacement of the Convention itself), but these amendments would only apply to States that become

Parties to the revision (Article 37). The WHC does not stipulate how to deal with disputes between Parties, only stating that a two-thirds majority is required for decisions made by the Committee.

Status, Evolution and Analysis

The Committee developed detailed Operational Guidelines for the Implementation of the World Heritage Convention to assist in site nomination and selection (UNESCO 2002). Sites that meet any of the cultural or natural criteria will not necessarily be included in the list – the Committee ultimately decides which sites are heritage listed (UNESCO 2002). Particular emphasis is placed on nominating Parties having adequate protective measures in place, and demonstrating effective implementation of those measures (UNESCO 2002). WHC-listed sites can be deleted from the list in certain circumstances, for example if the site has deteriorated and lost the values for which it was designated (see paragraphs 45 to 56 of the Operational Guidelines, UNESCO 2002). Sites nominated for listing must be of sufficient size and contain the necessary components of ecosystem processes essential for the conservation of the ecosystems and the site's biodiversity (UNESCO 2002).

Sites can be nominated by Contracting Parties or third-Party States but only with consent from the sovereign State. The WHC does not extend to the high seas (IUCN 1994). The text of the WHC could, if agreement were reached by a two thirds majority vote, be amended to explicitly address the high seas and facilitate site nomination for exceptional sites beyond national jurisdiction. Undoubtedly, the Antarctic has sites of international importance both from a natural and cultural point of view. Under Article 11.3 States have an obligation to consult and discuss designations with other Contracting Parties, so it is plausible that like-minded States could nominate and advocate high seas sites. The high profile of listed sites enhances their conservation due to public education and awareness of the importance of preserving these sites, which can apply political pressure if necessary to prevent damage and nominate further special sites that meet the criteria for designating sites of international importance.

In 1997 Australia designated two subantarctic sites: Heard and McDonald Islands (criteria N(i)(ii), http://whc.unesco.org/pg.cfm?cid=31andid_site=577, cited June 2005); and Macquarie Island (criteria N(i)(iii), http://whc.unesco.org/pg.cfm?cid=31andid_site=629, cited June 2005). In 1998, New

Zealand designated five island groups within the subantarctic: the Snares, Bounty Islands, Antipodes Islands, Auckland Islands and Campbell Island (criteria N (ii)(iv), see http://whc.unesco.org/pg.cfm?cid=31andid_site=877, cited June 2005). No sites have been designated beyond national jurisdiction in the Antarctic region due to the complicated status of territorial claims, although Greenpeace declared the Antarctic as a World Park in 1986 and this designation was supported by the Australian Conservation Foundation and the Antarctic and Southern Ocean Coalition (ASOC) (Rothwell 1990). This declaration is not recognised by the ATS and is not part of the World Heritage List.

3.3.5 The Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)[8]

CITES emerged in recognition of the values – economic, scientific, aesthetic, cultural, recreational - of wild fauna and flora, and the realisation that unregulated trade in certain species could jeopardise their survival (preamble). CITES places restrictions on trade including export, re-export, and introduction from the sea of certain species (Article I.c and d). Introduction from the sea refers to "transportation into a State of specimens of any species which were taken in the marine environment not under the jurisdiction of any State" (Article I.e): this applies to the high seas. CITES opened for signature on 03 March 1973, and entered into force on 01 July 1975. There were 169 Contracting Parties as at March 2006.

Appendix I lists species threatened with extinction that are or may be affected by trade, and are subject to strict regulation to prevent further endangerment via trade (Articles II.1 and III). Appendix II includes species vulnerable to trade but not necessarily threatened, or other species that may complement their control of Appendix II listed species (Articles II.2 and IV). Permits may be issued allowing trade of Appendix I or Appendix II species providing trade will not jeopardise species survival and that the activities are lawfully and humanely undertaken (Articles III and IV). Appendix III contains species subject to regulation within national jurisdiction that may benefit from the cooperation of other States to control over-exploitation and trade (Article II.3). Conditions for Appendix III species are less stringent than those listed in Appendices I and II (Article V). For a species to be added to Appendix I or II, it must meet biological

[8] 27 UST 1087

and trade criteria. Contracting Parties are encouraged to adopt the precautionary principle and to act in the best interests of the conservation of the species (Resolution Conf. 9.24 (Rev. COP12), Annex 4.A). Appendix I species cannot be de-listed unless they no longer meet Appendix I criteria, in which case they may be transferred to Appendix II for monitoring purposes (Resolution Conf. 9.24 (Rev. COP12), Annex 4.B). Currently, around 5,000 animal and 28,000 plant species are listed in the Appendices of CITES (http://www.cites.org/eng/disc/species.shtml, cited March 2006). The species occurring in the Antarctic are listed in Table 3.4.

Contracting Parties must implement various measures to fulfil their obligations under CITES. These include penalising States acting in a manner contrary to CITES and if necessary confiscation of specimens, management of a rescue centre to care for and return confiscated live specimens (Article VIII.1 to VIII.5); ongoing monitoring and reporting of trade in any species listed in the CITES Appendices (Article VIII.6). The Secretariat must inform any State if their trade in any species is causing detrimental impacts on that species (Article XIII). Nothing in CITES derogates from the rights and obligations of Contracting Parties under other domestic or international conventions (Article XIV.2 and 3), including future codification or development of LOSC (Article XIV.6). States may choose to adopt stricter regulation than CITES applies if desired (Article XIV.1). However, for those States that have signed international agreements or treaties that cover marine species that are listed in Appendix II, their obligations under CITES are waived for the species in question, in these cases the provisions of the aforementioned treaty apply (Article XIV.4). In cases where marine species are nominated for inclusion in Appendix I or Appendix II, the Secretariat liaises with the appropriate intergovernmental body to seek feedback and to ensure consistency in conservation measures (Article XV.2b).

CITES Parties must attempt to resolve any disputes amongst themselves, or if a resolution cannot be met between Parties they can refer their dispute to Permanent Court of Arbitration at The Hague and hence be bound by its decision (Article XVIII). Any Contracting Party may propose amendments to the Appendices under Article XV and XVI, and amendments are adopted by a two-thirds majority. General reservations to CITES are not permitted, but Parties may enter a reservation (within 90 days) related to any amendments to the Appendices made under Articles VI and XVI (Article XXIII),

Table 3.4 CITES Listed Species Occurring in the Antarctic

Scientific Name	Appendix	Common Name/s	Withdrawals / Reservations
Animals			
Berardius arnuxii	I and II	Arnoux's Beaked Whale; Southern Four-toothed Whale	
Physeter catodon	I and II	Cachalot; Cachelot; Pot Whale; Sperm Whale; Spermacet Whale	
Balaenoptera bonaerensis	I and II	Antarctic Minke Whale; Southern Minke Whale	Withdrawals: Peru Reservations: Japan
Balaenoptera musculus	I	Blue Whale; Sibbald's Rorqual; Sulphur-bottom Whale	Reservations: Iceland; Canada
Balaenoptera physalus	I and II	Common Rorqual; Fin Whale; Finback; Fin-backed Whale; Finner; Herring Whale; Razorback	Withdrawals: Former USSR; Canada; Australia; South Africa; Reservations: Iceland; Japan; Norway
Megaptera novaeangliae	I	Bunch; Hump Whale; Humpback Whale; Hunchbacked Whale	
Ziphius cavirostris	II	Cuvier's Beaked Whale; Goose-beaked Whale	
Arctocephalus gazella	II	Antarctic Fur Seal; Kerguelen Fur Seal	
Cygnus melanocorypha	II	Black-necked Swan	
Plants			
Antipathes glutinata	II	Black corals	
Antipathes plana	II	Black corals	
Abyssopathes lyriformis	II	Black corals	
Bathypathes alternata	II	Black corals	
Bathypathes bifida	II	Black corals	
Bathypathes erotema	II	Black corals	
Bathypathes patula	II	Black corals	
Bathypathes platycaulus	II	Black corals	
Lillipathes lilliei	II	Black corals	
Saropathes scoparia	II	Black corals	
Schizopathes crassa	II	Black corals	
Leptopenus antarcticus	II	Stony coral	
Caryophyllia cyathus	II	Hard corals, stony corals	
Caryophyllia mabahithi	II	Hard corals, stony corals	
Paraconotrochus antarctica	II	Hard corals, stony corals	
Flabellum impensum	II	Stony coral	
Flabellum ongulense	II	Stony coral	
Monomyces rubrum	II	Hard corals, stony corals	
Balanophyllia chnous	II	Stony coral	
Errina fissurata	II	Lace coral	
Errina gracilis	II	Lace coral	
Errina laterorifa	II	Lace Coral	

(http://www.cites.org/eng/resources/species.html, (Antarctic region), cited March 2006).

in which case the Parties in question would not be considered to be a Party to the CITES for that particular species (see Table 3.4 reservations). Appendix I is subject to

12 reservations and 6 withdrawals; Appendix II is subject to 2 reservations and 2 withdrawals as at December 2004. Appendix I reservations should treat the species in question as an Appendix II species under Resolution Conf. 4.25.

Status, Evolution and Analysis

CITES is a legally binding international instrument for species protection, and advocates cooperation with other regional and international conventions for species management, and appropriate international agencies or bodies. CITES applies to species irrespective of their location, so has the potential to contribute to conservation and sustainable use of species on the high seas and in the Antarctic. However restrictions would only apply to States Parties to the Convention. CITES only strictly protects specific endangered species under threat in Appendix I. However, CITES does take a precautionary approach for the management of Appendix II and III listed species, and Parties are encouraged to adopt the precautionary principle.

In 2002 the Australian government submitted a proposal for the listing of the Patagonian toothfish in Appendix II of CITES. Australia's proposal was met with almost unanimous opposition by CCAMLR members (New Zealand was the only member that supported Australia, although ASOC were also supportive of the proposal) (CCAMLR XXI, para's 10.26, 10.31-10.32 and 10.72). The opposition to Australia's proposal was primarily due to a widespread view that such a proposal undermined the authority and effectiveness of CCAMLR, the proposal didn't meet CITES criteria for listing, and that Australia should not have put forward the proposal prior to discussions with the CCAMLR Commission (CCAMLR XXI, para's 10.1 – 10.75, see also Fallon and Kriwoken 2004, Molenaar 2004b, Jabour 2006). The general feeling of Commission members was that a better approach would be to encourage CITES Contracting Parties to voluntarily adopt CCAMLR's CDS, and to encourage greater collaboration between CITES and the CMS (CCAMLR XXI, para's 10.33, 10.52, 10.59. Despite these objections, Australia did not withdraw their proposal to CITES for the listing of toothfish in Appendix II (CCAMLR XXI, para. 10.65). Some commentators suggest that gaining CITES listing of toothfish is highly unlikely (Fallon and Kriwoken 2004, Grant 2005).

3.3.6 The International Maritime Organisation and MARPOL 73/78

The International Maritime Organisation (IMO) facilitates international cooperation for safe, secure and efficient shipping on clean oceans, with member States numbering 166 as at March 2006. As part of its mandate, the IMO has since formed numerous measures and conventions that govern activities in the world's oceans. These conventions address anything from safety at sea through to prevention of pollution by ships and most recently the treatment of ballast water from ships to prevent accidental introductions that can cause devastation of the marine environment (for details on the IMO and its Conventions, see http://www.imo.org/home.asp, cited March 2006). The Marine Environment Protection Committee (MEPC) provides scientific advice to the IMO and assist in the formulation of new conventions and guidelines furthering the objectives of the IMO. Much of the work of the MEPC finds its way into resolutions, guidelines and conventions of the IMO.

Two key mechanisms for marine protection within the auspices of the IMO are Special Areas (established under MARPOL 73/78[9]) and Particularly Sensitive Sea Areas (PSSAs). Generally the purpose of designating Special Areas and PSSAs is to control for threats posed by vessels in vulnerable marine areas. The IMO provides guidelines for the identification, designation and measures for the protection of Special Areas and PSSAs (adopted in 2001, resolution A.927(22), see IMO 2001). Box 3.3 provides a summary of the currently designated areas designated as either Special Areas of PSSAs. Special Areas can be designated in enclosed or semi-enclosed areas of the territorial sea, the EEZ or the high seas, although the requirements of MARPOL 73/78 relate only to discharge of harmful substances in those areas (IMO 2003). Comparatively, PSSAs may be governed by measures such as re-routing to avoid passage through all or part of a PSSA, installation of Vessel Monitoring Systems (VMS), compulsory piloting schemes and creation of buffer zones (IMO 2003). The Antarctic Special Area covers the region south of 60° South and is designated as a Special Area under Annex I, Annex II and Annex V of MARPOL 73/78. Although this area is located in international waters, it is nonetheless provided elevated conservation status as a Special Area. Agenda 21 also references PSSAs (Gibson and Warren 1995). 'Areas to be avoided' are a further voluntary IMO marine classification whereby certain ships are discouraged from entering to avoid risk of pollution or damage (Gibson and Warren 1995).

[9] 12 ILM 1319; 17 ILM 546

Box 3.3 IMO Special Areas and Particularly Sensitive Sea Areas

Area Classification	*Designated Areas*
Special Areas: Areas which, for technical reasons relating to their oceanographical and ecological condition and to their sea traffic, the adoption of special mandatory methods for the prevention of sea pollution is required. Under the Convention, these special areas are provided with a higher level of protection than other areas of the sea.	▪ *Annex I:* Mediterranean Sea area; Baltic Sea area; Black Sea area; Red Sea area; "Gulfs" area; Gulf of Aden area; Antarctic area; North West European Waters, *(and Oman Sea, which will enter into force 01 January 2007)* ▪ *Annex II:* Baltic Sea area; Black Sea area; Antarctic area (south of 60° South) ▪ *Annex V:* Mediterranean Sea area; Baltic Sea area; Black Sea area; Red Sea area; "Gulfs" area; North Sea; Antarctic area; Wider Caribbean region (including the Gulf of Mexico and the Caribbean Sea) ▪ *Annex VI:* North Sea
Particularly Sensitive Sea Area (PSSA): An area that needs special protection through action by IMO because of its significance for recognized ecological or socio-economic or scientific reasons and which may be vulnerable to damage by international maritime activities. The criteria for the identification of particularly sensitive sea areas and the criteria for the designation of special areas are not mutually exclusive. In many cases a Particularly Sensitive Sea Area may be identified within a Special Area and vice versa.	▪ The Great Barrier Reef, Australia (1990) ▪ The Sabana-Camagüey Archipelago, Cuba (1997) ▪ Malpelo Island, Colombia (2002) ▪ Florida Keys, United States (2002) ▪ Wadden Sea, Denmark, Germany, Netherlands (2002), and ▪ The Paracas National Reserve, Peru(2003)

(http://www.imo.org/home.asp, cited March 2006; (MEPC 2002a, b)

MARPOL 73/78 was negotiated in recognition of the need for environmental and marine conservation in general, and to address the considerable threat that the deliberate, negligent or accidental release of oil and other harmful substances poses to the marine environment (preamble). MARPOL 73/78 was signed on 17 February 1978 and entered into force on 02 October 1983, subsuming the 1973 International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (MARPOL 73). Parties must adhere to Annexes I and II of MARPOL 73/78, however the adoption of the other annexes is voluntary and subject to separate ratification (see http://www.imo.org/home.asp, cited March 2006). Table 3.5 outlines the status of MARPOL 73/78 and its annexes.

The Annexes outline regulations and specifications to be adopted by Parties. Vessels must obtain a certificate from their local authority permitting them to carry restricted substances within the provisions of MARPOL 73/78. Measures address the carriage of hazardous substances, permissible distances from land for discharges; detailed technical specifications regarding substance handling and discharge (where appropriate), controls

on ballast water and vessel infrastructure and equipment requirements. Additionally, stringent measures apply for vulnerable areas classified as 'Special Areas'.

Table 3.5 Status of MARPOL 73/78

Annex	Title	Contracting States	Entry into force*
Annex I	Regulations for the Prevention of Pollution by Oil	136	02 October 1983
Annex II	Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk		
Annex III	Regulations for the Prevention of Pollution by Harmful Substances Carried By Sea in Packaged Forms, or in Freight Containers, Portable Tanks, or Road and Rail Tank Wagons.	120	01 July 1992
Annex IV	Regulations for the Prevention of Pollution by Sewage from Ships	107	27 September 2003
Annex V	Regulations for the Prevention of Pollution by Garbage from Ships	125	31 December 1988
Annex VI	Regulations for the Prevention of Air Pollution from Ships[10]	31	19 May 2005

* NB Amendments to Annex I and II will enter into force due 01 January 2007

(IMO homepage; see http://www.imo.org/home.asp, cited March 2006)

MARPOL 73/78 applies to ships operating under national jurisdiction or flying the flag of a Party to the Convention (Article 3.1). MARPOL 73/78 does not affect the rights or obligations of Parties under international law (see Articles 3.2 and 9.2). Contracting Parties must monitor, report and enforce any violations of the Convention whether made by their nationals or other vessels, and Article 4 of the Convention compels Parties to prohibit violations of MARPOL 73/78 and impose sanctions subject to criminal prosecution. Furthermore, all ships are subject to freedom of investigation under Article 5, and Parties must report any violations by their own nationals or others (Articles 5, 6 and 8). Contracting Parties are encouraged to communicate and cooperate, including the conduct of scientific research and training, towards meeting the objectives of MARPOL 73/78. Contracting Parties are encouraged to resolve disputes themselves, otherwise deferring to arbitration (Article 10). Amendments to the Convention are permitted under Article 16, and subject to a two-thirds majority vote.

Alien species are recognised as posing a major threat to the marine environment and concerns regarding their accidental introductions via ballast water led to the adoption of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) on 13 February 2004. The BWM Convention, with

[10] Annex VI was implemented under Article 2 of The Protocol of 1997 adoption of Annex VI - Regulations for the Prevention of Air Pollution from Ships.

just six Contracting Parties in March 2006, has not yet entered into force, but places strict controls on vessels for the prevention, minimisation and eventual elimination of accidental introductions via ships' ballast water. The BWM Convention was based on former voluntary ballast water guidelines adopted under IMO Assembly Resolution A.774(18) in 1993. These guidelines were developed in recognition of the devastating impacts that alien species could have in the marine environment, such as that observed in the North Sea in as early at 1903 (http://www.imo.org/home.asp, cited March 2006). Alien species can take over marine areas and alter entire ecosystems if left unchecked, but retrospectively addressing introductions can be costly, time consuming and may be too late to prevent extensive damage. The BWM Convention indicates a move towards proactive and preventative initiatives that seek to protect the marine environment.

Status, Evolution and Analysis

The actions of the IMO and ongoing amendments to MARPOL 73/78 demonstrate their adaptive approach. MARPOL 73/78 is an instrument that was constructed to allow for ongoing amendments and additions to its scope and the ability to accommodate the emerging changes in conservation science must be recognised as forward thinking at its conception. The recognition that there are areas within the marine environment that require particular care (Special Areas, PSSAs and Areas to be Avoided) further strengthens the contribution that MARPOL and the IMO can make in governing pollution of the marine environment. However, these protective measures only apply to shipping activities. Special Areas can be designated on the high seas, (the Antarctic Special Area applies to the region south of 60° South) and are only subject to restrictions regarding vessel discharges. The recently signed BWM Convention represents a significant step towards more comprehensive marine environment protection.

Species protection, the ecosystem and precautionary approach do not form a major part of the mandate of the IMO of MARPOL 73/78, and unless the IMO continues to extend its mandate to incorporate marine conservation and sustainable use, it is of limited use in the Antarctic. Protection of the Antarctic in the form of a Special Area is by no means comprehensive and adequate. However, the IMO does have membership of 166 States, which means that the IMO has great potential to influence global marine-based activities. In the past the IMO has considered a proposal submitted by Canada for a Polar Shipping Code, however the code was only adopted as voluntary guidelines in

the Arctic, and was criticised by Treaty Parties as not having taken sufficient consideration of the variations between the two polar regions, and potentially undermining or conflicting with the Antarctic Treaty (Scovazzi 2000). However, the IMO discussions regarding the draft polar code did influence the ATS and lead to the adoption of Antarctic shipping guidelines and greater communication between the IMO and ATCPs (Scovazzi 2000). More recently, Treaty Parties adopted Resolution 3(2006) Ballast Water Exchange in the Antarctic Treaty Area, incorporating guidelines on ballast water exchange to minimise alien introductions in the region, and Decision 2(2006) regarding communication of the guidelines and appropriate action by the MEPC of the IMO.

3.3.7 UNEP's Regional Seas Programme (1974)

The UNEP Regional Seas Programme was launched in 1974 to facilitate regional cooperation in an effort to address marine and coastal degradation (Adler 1993). The process of implementing a Regional Seas Agreement (RSA) begins with an action plan that outlines the planned strategy for protecting the common region in question. The action plan should be implemented by a legally binding regime (such as a Convention or Treaty) that outlines the regional measures for the conservation of the area in question, and demonstrates the commitment by participating States to the action plan. This regional approach allows for the development of strong cooperative relationships that can cater to the specific needs and conditions of the region and create appropriate measures for marine protection under UNEP's guidance.

Status, Evolution and Analysis

After 30 years the Programme has seen over 140 countries involved in 18 regions including the Black Sea, Caribbean, East Africa, East Asia, the Kuwait Convention region, Mediterranean, North-East Pacific, North-West Pacific, Red Sea and Gulf of Aden, South Asia, South-East Pacific, South Pacific, and West and Central Africa (see http://www.unep.org/regionalseas/About/default.asp, cited March 2006). There is no Regional Seas Agreement for the Southern Ocean, although reference is made by UNEP to the unique circumstances of the Antarctic which is governed by the instruments of the ATS and in particular, CCAMLR. UNEP is an observer at Antarctic Treaty Consultative Meetings (ATCMs) and regularly contributes information papers for consideration by the Parties.

CCAMLR could arguably be considered a RSA, since it is a multilateral agreement between like-minded States. Membership is open to all interested States and organisations (not just ATS signatories), and measures are put in place to manage and conserve the marine living resources of the region. The development of a new RSA in the Southern Ocean is likely to meet with significant resistance, especially from CCAMLR signatories and the CCAMLR Commission as it is likely to be seen to weaken the operation of the ATS and the role of CCAMLR.

The Convention on the Conservation of Migratory Species of Wild Animals (1979)[11]

CMS recognises the role that migratory species play in the world's natural system and the need for their conservation and wise use (preamble). Management of migratory species presents a challenge due to their transitory nature, and they are particularly vulnerable to habitat loss and degradation in breeding and foraging areas, and excessive hunting along migratory paths (Anon. 2002). Migratory species may be avian, marine or terrestrial (Anon. 2002). CMS was signed at Bonn on 23 June 1979, entering into force on 01 November 1983. CMS had 95 Contracting Parties in March 2006.

CMS applies to activities of States Parties within national jurisdiction, and to flag vessels engaged in activities beyond national jurisdiction (Article I.1h). The rights and obligations of Parties under existing treaties, conventions or agreements are not affected by their participation in CMS (Article XII). Range States[12] of migratory species must conserve migratory species that are endangered or of an unfavourable conservation status (Article II.1 and II.2). CMS and its related agreements place obligations on signatories to research, cooperate, monitor and manage migratory species and their habitats (Articles II.3 and V.5).

Appendix I species must be strictly protected by Contracting Parties due to their critical conservation status. These species may only be taken for scientific research, population restoration or by traditional subsistence users (Article II.3a and III.5). Additionally,

[11] 19 ILM 15

[12] Article I.1h defines Range States as "...any State (and where appropriate any other Party referred to under subparagraph (k) of this paragraph) that exercises jurisdiction over any part of the range of that migratory species, or a State, flag vessels of which are engaged outside national jurisdictional limits in taking that migratory species". The term 'Party' may refer to a State or relevant Regional Economic integration organisation (Article I.1k).

Range States must conserve and restore important habitats, prevent, monitor and remedy harmful activities that may further endanger those species (Article III.4). Appendix I species may not be taken unless for scientific or breeding purposes. Listing and delisting of Appendix I species must be done on the basis of best scientific evidence available (Article III.2 and III.3). The species listed in Appendix II include those of unfavourable conservation status or those that will substantially benefit from the conclusion of international agreements for their conservation and management (Article IV.1). The appendices have been regularly updated, with Appendix I having 109 listed species. There are 30 CMS listed species that occur within the Antarctic (see Table 3.6).

Contracting Parties are obliged to conclude Agreements for Appendix II species that aim to restore and maintain listed species to a favourable conservation status (Article II.3, V.1 and V.3) (over 188 species and subspecies were listed as Appendix II species, see http://www.cms.int/documents/appendix/cms_app2.htm, cited March 2006). Signature to any such agreement is open to any Range State, not just CMS signatories (Article V.2) (see Box 3.4). Amendments to the text of CMS may be proposed by any Contracting Party, and adopted with a two-thirds majority vote (Article X). Similarly, Article XI allows for amendments to be made to the appendices providing they are supported by best scientific evidence available. CMS Parties are encouraged to cooperate to resolve any disputes or otherwise to refer the matter to the Permanent Court of Arbitration (Article XIII). The general text cannot be subject to reservations, however Contracting Parties may enter reservations regarding species listed in the Appendices (Article XIV).

Status, Evolution and Analysis

CMS is a voluntary framework Convention, hence effective implementation and enforcement depends upon Contracting Parties having created national legislation that monitors compliance and imposes sanctions for non-compliance. CMS provides for *in-situ* and *ex-situ* conservation of migratory species of wild animals over their entire range so does apply to the high seas. CMS applies to activities of Contracting Parties irrespective of their location, including flag vessels engaged in activities on the high seas. Since its inception, numerous Agreements and Memoranda of Understanding (MOU). Agreements have been created under Article V are legally binding on Range States signatories (Box 3.4). MOUs are voluntary agreements that indicate an intention to cooperate for species conservation but are not legally binding.

Table 3.6 CMS Listed Species Occurring in the Antarctic

Species occurring in the Antarctic	Appendix I	Appendix II
Antarctic Minke Whale *(Balaenoptera bonaerensis)*		✓
Blue Whale *(Balaenoptera musculus)*		✓
Fin Whale *(Balaenoptera physalus)*	✓	✓
Humpback Whale *(Megaptera novaeangliae)*	✓	
Sei Whale *(Balaenoptera borealis)*	✓	✓
Pygmy Right Whale *(Caperea marginata)*		✓
Southern Right Whale *(Eubalaena australis)*	✓	
Sperm Whale *(Physeter macrocephalus)*	✓	✓
Killer Whale *(Orcinus orca)*		✓
Spectacled Porpoise *(Phocoena dioptrica)*		✓
Southern Sea Lion *(Otaria flavescens)*		✓
Southern Fur Seals *(Arctocephalus* ssp.)		✓
Amsterdam Albatross *(Diomedea amsterdamensis)*		✓
Black-browed Albatross *(Thalassarche melanophrys)*		✓
Campbell Albatross *(Thalassarche impavida)*		✓
Grey-headed Albatross *(Thalassarche chrysostoma)*		✓
Indian Yellow-nosed Albatross *(Thalassarche carteri)*		✓
Light-mantled Sooty Albatross *(Phoebetria palpebrata)*		✓
Northern Albatross *(Diomedea sanfordi)*		✓
Salvin's Albatross *(Thalassarche salvini)*		✓
Shy Albatross *(Thalassarche cauta)*		✓
Sooty Albatross *(Phoebetria fusca)*		✓
Southern Royal Albatross *(Diomedea epomophora)*		✓
Wandering Albatross *(Diomedea exulans)*		✓
White-capped Albatross *(Thalassarche steadi)*		✓
Northern Giant-petrel *(Macronectes halli)*		✓
Southern Giant-petrel *(Macronectes giganteus)*		✓
Grey Petrel *(Procellaria cinerea)*		✓
White-chinned Petrel *(Procellaria aequinoctialis)*		✓
Arctic Tern *(Sterna paradisaea)*		✓

Source: (ATCM XXVII / IP088 2004)

Box 3.4 CMS Agreements and Memoranda of Understanding

- Agreement on the Conservation of Seals in the Wadden Sea
- Agreement on the Conservation of Populations of European Bats
- Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas
- Agreement on the Conservation of African-Eurasian Migratory Waterbirds
- Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
- Agreement on the Conservation of Albatrosses and Petrels
- MOU concerning Conservation Measures for the Siberian Crane, *Grus leucogeranus*
- MOU concerning Conservation Measures for the Slender-billed Curlew, *Numenius tenuirostris*
- MOU concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa
- MOU on the Conservation and Management of the Middle-European Population of the Great Bustard, *Otis tarda*
- MOU concerning Conservation Measures for MarineTurtles of the Indian Ocean and South-East Asia
- MOU concerning Conservation and Restoration of the Bukhara Deer, *Cervus elaphus bactrianus*
- MOU concerning Conservation Measures for the Aquatic Warbler, *Acrocephalus paludicola*

Source: CMS Homepage, http://www.cms.int, cited December 2004

Appendix II species may either have a vulnerable status or be seen to substantially benefit from the conclusion of international conservation agreements for their management. This incorporates a somewhat precautionary approach, since there is an

obligation that Contracting Parties formulate agreements prior to species reaching a critical conservation risk. CMS does not mention the application of the ecosystem approach, nor does it mention dependent and associated species.

The Agreement on the Conservation of Albatrosses and Petrels

ACAP is an implementing agreement of CMS and was finalised in Cape Town between 29 January and 02 February 2001. ACAP aims to achieve and maintain a favourable conservation status for albatrosses and petrels via implementing measures and the adoption of the precautionary approach (Article II). ACAP applies to the 21 recognised albatross species and seven petrel species occurring in the Southern Hemisphere (http://www.acap.aq, cited March 2006). The Agreement covers 25 range states, 11 of which have signed ACAP. ACAP entered into force in 01 February 2004, and as at March 2006 ACAP had eight Contracting Parties, all of whom are Contracting Parties to the ATS (ATCM XXVI 2003).

Status, Evolution and Analysis

ACAP is a classic example of reactive conservation, since the Agreement was formed in response to the issue of seabird by-catch in longline fisheries. Despite this, it could also be argued that ACAP takes a precautionary approach since it has provisions to initiate conservation measures in the absence of full scientific knowledge regarding some species such as white-chinned or grey petrels (ATCM XXVII / IP088 2004). The Action Plan forms the foundation of measures that Contracting Parties should take for the conservation of listed albatross and petrel species. The Action Plan reinforces many principles and measures set forth in CMS, setting guidelines and obligations relating to species conservation (endorsing the precautionary approach), habitat protection and restoration, management of human activities and impacts, research and monitoring, education and training and implementation (http://www.cms.int/species/acap/acap_ap.htm, cited March 2006). Whether proactive or reactive, ACAP has the potential to contribute towards the conservation of Southern Ocean albatross and petrel species since it attempts to reduce albatross and petrel mortality associated with longline fisheries (otherwise known as by-catch).

Contracting Parties to the instruments of the ATS that are also ACAP Range States were encouraged to become signatories to ACAP at a recent Antarctic Treaty Consultative Meeting (ATCM) (ATCM XXVII / IP088 2004). The CCAMLR

Commission was involved in negotiations of ACAP and has assisted in the development of measures for ACAP. Additionally, SCAR, ASOC and the Antarctic Treaty Secretariat also participate at the COP. This level of involvement and interaction signals the recognition of ATCPs of the need to collaborate with international instruments that apply within the Antarctic to ensure compatibility in approach and reduce potential conflicts between instruments.

3.3.8 The Law of the Sea Convention and Related Agreements (1982)[13]

LOSC was negotiated by the international community to address the conflicts regarding ocean resources and to resolve the issue of access and sovereignty to the ocean and ocean beds. The negotiation process took 15 years, and led to the development of rules, regulations and uses of ocean resources, and the conclusion that the seabed and subsoil beyond national jurisdiction are the common heritage of mankind. Under the LOSC the marine living resources of the high seas are subject to open access and access to international waters should only be for peaceful purposes. The LOSC was done in Montego Bay on 10 December 1982, entering into force on 16 November 1994 with 149 Contracting Parties as at March 2006[14]. The LOSC comprises 320 articles outlining obligations of States Parties, hence a brief summary follows.

The LOSC partitions the sea into areas within or beyond national jurisdiction. Areas under national jurisdiction comprise territorial seas (the area up to 12 nautical miles from terrestrial baselines), the contiguous zone (from territorial seas to 24 nautical miles) and the EEZ (from the contiguous zone to 200 nautical miles) (Articles 3, 33 and 57 respectively). Areas beyond the EEZ are international waters or high seas. States exercising jurisdiction can explore, exploit, conserve and manage all resources within their jurisdiction including the seabed and subsoil (Articles 33, 55, 56), and may establish and use artificial islands, installations and structures, conduct marine scientific research and protect and preserve the marine environment (Article 56-1b and c). Coastal States may explore and exploit the resources of the continental shelf – and may in some cases

[13] 21 ILM 1261.

[14] The Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 addresses issues relating to mining 'the Area' and reinforces the aim to achieve universal adoption of the LOSC. The Implementing Agreement was adopted on 28 July 1994 and entered into force on 28 July 1996, with 122 ratifications as at March 2006. New signatories to the LOSC must also sign the Implementing Agreement.

claim jurisdiction on the continental shelf beyond their EEZ, (see Articles 76 to 85), as Australia has done off its Antarctic Territory (Jabour 2006a).

Contracting Parties must protect and preserve the marine environment whilst exercising their sovereign rights to exploit those resources (Article 193). Parties must also set catch limits, conserve and manage their marine living resources to prevent over-exploitation, maintain and restore stocks of both target and dependent or associated species, and prevent and control marine pollution from any source (Articles 61 and 194). If a coastal State does not fully exploit its marine living resources they should formulate agreements with other States to allow access to their seas consistent with national conservation measures (Article 62). States that exploit migratory species listed in Annex I of the LOSC must cooperate with appropriate international organisations to ensure their conservation and optimal use[15] (Article 64-1) (see Appendix 2). This applies both within and beyond the EEZ. If no such organisation exists, then Contracting Parties should cooperate to establish one (Article 64-2). Marine mammals and cetaceans in particular, may be subject to stricter regulations than set forth in LOSC, and Contracting Parties are encouraged to cooperate with relevant international organisations to ensure the conservation of marine mammals under Article 65. These conditions also apply to high seas marine mammals (Article 120). Contracting Parties are encouraged to cooperate regionally and globally in pursuit of the objectives and measures under the LOSC, including fulfilling their obligations under international law (various Articles including 197 to 201, 235, 236). If a Coastal State believes that a foreign ship has acted in contravention of its laws and regulations when within its jurisdiction, it is entitled to undertake an uninterrupted hot pursuit with the aim of taking legal action against them and/or seizing their vessel or catch (Article 111). Marine scientific research within and beyond national jurisdiction is encouraged (Articles 238 to 265).

Contracting Parties carrying out activities beyond national jurisdiction are subject to the measures of the LOSC as outlined in Part VII of the Convention (Articles 86 to 120). Exploitation of the seabed and subsoil beyond the EEZ (otherwise known as the Area and managed by the International Seabed Authority - ISA) is prohibited to all States (Articles 1.1, 136, 173, 141). The high seas and the Area cannot be subject to sovereign

[15] This is often referred to as Maximum Sustainable Yield (MSY), whereby fisheries extract the maximum numbers possible that still allows for species recruitment and future sustainability.

claims, are reserved for peaceful purposes (e.g. navigation, laying cables/pipelines) and are the common heritage of mankind. The high seas are subject to freedom of navigation, fishing and scientific research (Articles 87 to 89), however any ships undertaking activities in the high seas are subject to the jurisdiction of their flag State (Article 91). Contracting Parties have a duty to take measures for the conservation of high seas living resources (Article 117), including cooperating with other States, subregional and regional fisheries management organisations (RFMOs, sometimes referred to as FMOs[16]) to conserve, manage, maintain and restore those resources (Articles 118 and 119).

The LOSC has substantial and complex arrangements to deal with and advise on voting issues, disputes, interpretation of the Convention and non-compliance. Disputes may be referred to a number of sources depending upon their nature; the International Tribunal for the Law of the Sea; the International Court of Justice; or an arbitral tribunal (Article 287). Section 5 also established the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea to assist in matters of non-compliance (Article 162). Any court or tribunal may take measures as necessary to prevent serious harm to the marine environments until a decision regarding the dispute/matter has been made (Article 290). Decisions made by any court or tribunal are final and binding (Article 296). Reservations are not permitted under the LOSC, however Contracting Parties can make declarations or statements for the purpose of harmonising the LOSC with its local laws (Article 309 and 310). Any such declaration or statement does not exclude them from any obligations under the LOSC.

Status, Evolution and Analysis

LOSC obligations apply to target species and dependent and associated species, which goes some way to adopting an ecosystem approach. However, since EEZs are based on political, not environmental or physical boundaries, the adoption of the ecosystem approach is not comprehensive. Protective measures are at the discretion of Contracting Parties, but could include measures for species, *in-situ* and *ex-situ* conservation and may cover the high seas. For highly migratory species listed in Annex 1 (see Appendix 2), Parties are obliged to cooperate with the relevant international organisations to ensure

[16] An example of a RFMO is the Commission for the Conservation of Antarctic Marine Living Resources, which manages the marine living resources of the Southern Ocean, see Chapter 4.

their conservation and sustainable use. The most significant of these in the context of the Southern Ocean is cetaceans.

Contracting Parties are encouraged to cooperate with other Contracting Parties and RFMOs to conserve, manage, maintain and restore ocean resources[17]. Hence, any State Party to LOSC should, in the case of the Antarctic, cooperate with CCAMLR to ensure the conservation and sustainable use of Southern Ocean marine living resources. This is an explicit condition of LOSC and is legally binding. The right to exploit high seas resources together with the obligation to take measures to conserve them poses challenges in implementation, and is a matter that needs to be addressed by States Parties and RFMOs to remove any ambiguity. Balancing of these mutually divergent requirements is currently one of the greatest challenges facing the international community with respect to the high seas.

The Fish Stocks Agreement (1995)[18]

The FSA, an implementing agreement of the LOSC, encourages Contracting Parties to create regional or subregional agreements for the conservation and management of straddling or highly migratory fish stocks (Article I-2). The FSA was adopted on 04 December 1995 and entered into force 11 December 2001, with 57 Contracting Parties as at March 2006. The FSA applies to fish stocks both within and beyond national jurisdiction (Article 3.1). There is an obligation to adopt the precautionary approach and create measures based upon best scientific evidence available to ensure the long-term sustainability of straddling and highly migratory fish stocks applying the principal of optimum utilisation (Article 5a-c). Adopted measures should minimise pollution, waste and discards, and prevent unintentional by-catch and impacts on other species (Article 5f). Article 6 outlines the means by which the precautionary approach should be applied, stating that "[t]he absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures" (Article 6.2). Contracting Parties are encouraged to set reference points that take uncertainty into account, undertake research to improve knowledge and understanding of the marine environment, and use best scientific knowledge in decision-making.

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[17] Regulation of activities relating to the seabed is the responsibility of the International Seabed Authority (ISA) and is not considered high seas.

[18] 34 ILM 1542

Furthermore, target and non-target species should be considered in the decision-making process. Annex II provides guidelines to assist Contracting Parties in setting appropriate catch limits. Contracting Parties are encouraged to resolve disputes peacefully and cooperatively (Article 27), and to take action to prevent disputes (Article 28). Decision-making is by consensus (Article 45). The FSA has great potential for positive conservation outcomes but is still in early stages of implementation so as yet the full (potential) conservation benefits are yet to be seen.

Status, Evolution and Analysis

The FSA is amongst the more promising international conservation instruments developed in recent years, since it facilitates and encourages cooperation to protect fish stocks across their entire range, irrespective of jurisdiction. This goes some way towards adoption of the ecosystem approach, however there is no explicit mention of the need to consider dependent and associated species. This is not to say that an implementing agreement adopted under the FSA could not incorporate the ecosystem approach into its measures, but there is no formal requirement to do so. However, the FSA does compel Contracting Parties to adopt a precautionary approach to ensure the preservation of marine living resources and their environment and control for impacts on target species. The measures set forth in any agreement negotiated under FSA vary depending upon the associated threats and impacts, however Parties must incorporate the long-term sustainable and optimal use of the target species as part of their objectives.

3.3.9 BirdLife International and Important Bird Areas (1989)

BirdLife International (BirdLife) is a Non Government Organisation (NGO) that advocates a multi-faceted conservation approach that covers species, sites, habitats and people (http://www.birdlife.net, cited December 2004). Species conservation aims to maintain the populations and ranges of all naturally occurring wild bird species of the world, particularly since decreasing bird populations can indicate a loss in biological diversity (BirdLife International 2004). The IBA Program identifies key bird sites and habitats, which, in conjunction with species protection and advocacy (or stewardship) can contribute towards achieving BirdLife's conservation objectives. The first official IBA Inventory was published in 1989 in Europe following an update of an initial inventory undertaken between 1979 and 1981 to identify important sites for nomination

under the European Economic Community Wild Birds Directive (Grimmett and Jones 1989).

BirdLife's IBA program allows for the identification, prioritisation and conservation of a global network of sites that are of importance to birds. IBAs should cover multiple species and be large enough to be self-sustaining thus maximising the conservation benefits to birds and other species present on-site (http://www.birdlife.net/action/science/sites/index.html; cited December 2004). IBAs must be practical sites for conservation action, and can either be terrestrial or marine. BirdLife has developed partnerships or completed inventories covering around 130 States as at December 2004 and identifying around 10,000 IBAs. Over 500 Endemic Bird Areas have also been identified in around 150 States. An inventory is currently underway in the Antarctic, whilst some subantarctic islands already have IBAs, including one in Norway's Bouvetøya (Bouvet) Island; and 17 in French subantarctic Islands (see http://www.birdlife.org/worldwide/national/index.html; cited December 2004).

The IBA criteria (Box 3.5) enable rigorous, quantitative identification of candidate IBAs that can subsequently be prioritised based upon the number and type of criteria they meet. Once a list of candidate IBAs is created and published in an IBA Inventory they formally become recognised as IBAs. BirdLife International emphasises the value of formal protection of IBAs within national, regional and international law (http://www.birdlife.net/vision/conservation_goals/habitats.html, cited March 2006). Designation of an IBA does not necessarily preclude an area from human activities since the process simply recognises the bird values of a site. The choice of whether to protect a site is at the discretion of the managers who can use this and other facts to inform their decisions regarding site management. In some cases sites can be managed to allow for mutually compatible human uses provided they do not threaten the conservation goals of the site. IBAs may be monitored and evaluated periodically to assess change and inform managers as to appropriate management strategies.

The marine habitat is of vital importance to many seabird species, particularly albatrosses and petrels that migrate long distances across the world's oceans and spend over 65% of their lives at sea (Woehler et al. 2003). A major threat to the survival of albatross and petrel populations has been their depletion due to fisheries by-catch.

BirdLife International has worked with FAO members to develop the 1999 International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries (IPOA-Seabirds) relating to by-catch of albatross and petrel populations (see Section 2.3.14). BirdLife has also commenced work on identifying and designating marine IBAs within international waters (http://www.birdlife.net/action/science/sites/index.html, cited March 2006).

Box 3.5 Criteria for the identification of candidate Important Bird Areas

Criteria	Description
A1 – Globally threatened species	The site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern
A2 – Restricted-range species	The site is known or thought to hold a significant component of the restricted-range species whose breeding distributions define and Endemic Bird Area or Secondary Areas
A3 – Biome-restricted assemblage	The site is known or thought to hold a significant component of the group of species whose distributions are largely or wholly confined to one biome.
A4 – Congregations	i) The site is known or thought to hold, on a regular basis, more than 1% of a biogeographic population of a congregatory waterbird species
	ii) The site is known to or thought to hold, on a regular basis, more than 1% of the global population of a congregatory seabird or terrestrial species.
	iii) The site is known or thought to hold, on a regular basis, more than 20,000 waterbirds or 10,000 pairs of seabirds or one or more species*
	iv) The site is known to or thought to exceed thresholds set for migratory species bottleneck sites

**This criterion is based upon Ramsar criteria* (Dunn et al. 1999)

Status, Evolution and Analysis

BirdLife has developed cooperative relationships and agreements with numerous international conventions and bodies[19], which reflects the growing recognition of the need for an integrated approach to the issue of conservation and sustainable use of the world's natural resources. Given the paucity of data on the marine environment, and the need for urgent action for its protection, IBAs, or the use of observations of seabirds, may be a way forward at the present time. BirdLife has been working with the SCAR Working Group on Biology (SCAR-WGB) to compile a list of candidate IBA for the Antarctic continent (SCAR-WGB 2000, Harris and Woehler 2004, SCAR-LSSSG 2004). BirdLife has also been making progress towards the development of a program and criteria for marine IBAs, an approach that could be a useful for the Southern Ocean (Dunn et al. 1999, Huggett 2001, BirdLife International 2004).

19 BirdLife International has lobbied, collaborated and cooperated with numerous bodies and agreement secretariats such as the IUCN, CBD, Ramsar, CITES, CMS, UNFCCC and the Kyoto Protocol, the FAO, and the European Unions Birds and Habitat's Directives to name a few (http://www.birdlife.net/action/science/conventions/index.html, cited March 2006).

The IBA program uses pragmatic, quantitative criteria (based largely on Ramsar criteria) to identify and prioritise candidate IBAs, and the IBA Program is internationally recognised. Since birds can act as potential indicators of marine biodiversity, they could aid in the identification of key marine areas for protection not just for birds, but for other dependent and associated species. Implementing a marine IBAs program in the Antarctic would represent an important contribution to aiding in the selection of sites, particularly since the data available on Antarctic avifauna are amongst the most comprehensive in the region. Furthermore, the CCAMLR Commission has indicated that the development of an Antarctic MPA network will be delayed until the Antarctic marine bioregionalisation has been completed (CCAMLR Commission 2005). A marine IBA inventory could form a useful decision-making tool for the CCAMLR Commission when it comes to site selection and prioritisation. Until then, the Commission has tabled the option of creating pilot MPAs to provide feedback into the effective management of MPAs within the context, and consistent with the objectives, of CCAMLR. Since IBAs do not require that sites are formally protected under national law (although it is recommended, particularly for critical sites), the adoption of the IBA Program in the Antarctic would not undermine the operation of the ATS, nor would it pose a threat with regard to territorial claims. Indeed, this approach could foster greater support and understanding of the necessity and benefits of MPAs within the context of the ATS.

3.3.10 UN Framework Convention on Climate Change and Kyoto Protocol (1992)

There is much debate over the issue of climate change, which is seen by some as posing a high risk to marine living resources (De Fontaubert et al. 1996). A rise in global temperatures could result in sea level rises and increases in sea surface temperatures, which could alter species' compositions and distributions, cause extinctions, alter global ocean currents, and influence productivity. This is particularly the case as the oceans play a key role in moderating the global climate via carbon uptake (De Fontaubert et al. 1996). Polar regions are of particular relevance when it comes to climate change due to their sensitivity (small changes in global climate could dramatically alter polar ecosystems, see Han et al. 2002, Wall 2005) and they are also valuable areas for the early detection of climate change – as evidenced by the detection of holes in the stratospheric ozone layer over the Antarctic and the Arctic (UNEP 2002).

The UNFCCC[20] and related instruments aim to reduce and stabilise atmospheric greenhouse gas concentrations to levels that allow ecosystems to adapt naturally to climate change and enable sustainable economic development (Article 2)[21]. The adoption of the precautionary approach is a critical part of the UNFCCC given the level of scientific uncertainty regarding the causes and impacts of climate change (preamble, Article 3-3). Contracting Parties should promote sustainable measures via policy and measures to protect against anthropogenic climate change (Articles 3-4 and 4-1d). UNFCCC refers to the importance and conservation of both the marine and terrestrial environment as sinks and reservoirs of greenhouse emissions (preamble, Article 4-1d). UNFCCC promotes cooperation towards the development and elaboration of integrated plans for coastal zone management (Article 4-1e). The UNFCCC was signed in New York on 09 May 1992, rapidly entering into force on 24 March 1994. There were 189 Contracting Parties to the UNFCC in March 2006.

Status, Evolution and Analysis

The Kyoto Protocol reinforces the obligations of Parties under the UNFCCC, formalising and increasing the responsibilities of developed and other States listed in Annex I of the UNFCCC (Article 2-1a). Parties are obliged to take measures for the protection and enhancement of sinks and reservoirs of greenhouse gases – these could include marine areas within national jurisdiction. The UNFCCC and Kyoto Protocol recognise that developed States are responsible for the majority of emissions, placing greater obligations on them to reduce their emission levels (Kyoto Protocol, Article 3-1). The Kyoto Protocol was signed on 11 December 1997 and entered into force on 16 February 2005. In March 2006 there were 162 Contracting Parties to the Protocol.

The aim of the UNFCCC is to reduce and stabilise greenhouse gas emissions to levels that would enable ecosystems to adapt naturally to climate change. This could partially go towards taking an ecosystem approach, since the UNFCCC attempts to influence States in considering the implications of their actions on a global scale. However the

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[20] 31 ILM 849

[21] It is worth mentioning that the Montreal Protocol on Substances that Deplete the Ozone Layer (the Montreal Protocol) was done in Montreal 16 September 1987 and entered into force in August 1992, with the London Amendment adopted in June 1990 (1989 ATS 18 and 2005 ATS 29). The Montreal Protocol is a good example of an instrument that was rapidly adopted in response to emerging knowledge on environmental impacts from harmful substances and demonstrates that in the presence of political will, the international community can act rapidly to effect change. The Montreal Protocol is not considered in detail here as it does not make any mention of species/area protection or oceans/marine areas.

Convention does not contain explicit measures for the protection of species, areas or ecosystems/habitats. Whilst the UNFCCC calls for conservation of terrestrial and marine environments it does not describe how this conservation should be implemented at a national level, other than suggesting that States should take measures to protect and enhance sinks of reservoir gasses. Measures could include MPAs within national jurisdiction. The Convention could be interpreted to be taking a precautionary approach since it attempts to encourage States to take measures to prevent greenhouse emissions in the absence of full scientific knowledge or agreement regarding the extent, and impacts, of climate change. The UNFCCC is not a comprehensive conservation instrument, although being a climate change convention this could be considered beyond its mandate, however it is critical since the impacts of climate change could be catastrophic for species, habitats and ecosystems.

3.3.11 The Convention on Biological Diversity (1992)[22]

The CBD was negotiated following concerns regarding the impacts that some human activities were having on biological diversity, and the potential implications of the loss of biological diversity. The CBD acknowledges the "intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components" (preamble). The values requiring conservation include actual and potential values and uses. The CBD advocates the precautionary approach, stating that "where there is a threat of significant reduction or loss of biological diversity, lack of scientific certainty should not be used as a reason for postponing measures to avoid or minimise such a threat" (preamble). The CBD was opened for signature in Rio de Janeiro on 05 June 1992 (Article 33), and entered into force on 29 December 1993. The CBD had been ratified by 188 Contracting Parties as at March 2006. The objectives of the CBD are "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources." (Article 1).

Biological diversity and ecosystem function do not generally conform to political boundaries. Therefore, whilst Contracting Parties have the sovereign right to exploit their own resources, their activities must not cause environmental damage outside

[22] 31 ILM 818

national jurisdiction (Article 3). Contracting Parties are bound by the provisions of the CBD within national jurisdiction, or for activities and processes undertaken under their national jurisdiction irrespective of location (Article 4-a and b). Contracting Parties and international organisations must cooperate to achieve the conservation and sustainable use of biological diversity in areas beyond national jurisdiction or in areas of mutual interest, for example in the high seas or Antarctic (Article 5). Furthermore, Contracting Parties to the CBD must meet their obligations under other international agreements, except where a significant threat to biological diversity exists (Article 22). Article 22-2 specifically refers the issue of the marine environment, stating that Parties must implement the CBD consistently with rights and obligations of States under the LOSC. Potential overlaps or issues regarding other international conventions must be discussed with the appropriate executive bodies at the COP (Article 23-4h).

Contracting Parties have a duty to identify and monitor key ecosystems and habitats, species and communities, and important genomes and genes and ensure effective measures for their conservation and sustainable use (Articles 6 and 7, Annex I). The preamble cites *in-situ* conservation measures as those most important for the conservation of biological diversity. Measures for *in-situ* and *ex-situ* conservation are outlined in Box 3.6 and Box 3.7 respectively. Obligations include area and species protection, restoration and rehabilitation; and research, education and training regarding the conservation and sustainable use of biological diversity (Articles 10, 12 and 13). Contracting Parties are required to regularly report on their implementation of the CBD (Article 26). In the event of a dispute, Parties must attempt to resolve the dispute themselves or request mediation by a third Party. If no resolution has been possible then disputing Parties should go to arbitration or the International Court of Justice (Article 27). No reservations are permitted (Article 37). Articles 29 and 30 describe the conditions that apply to make amendments to the text of the Convention or its appendices, which should ideally be reached by consensus, or as a last resort, by a two-thirds majority vote.

Status, Evolution and Analysis

An important progression in marine conservation initiatives under the CBD was the 1995 adoption of the Jakarta Mandate on Marine and Coastal Biodiversity (Jakarta Mandate) (Decision II/10). The Jakarta Mandate focuses on implementing the

Box 3.6 The CBD: Measures for *in-situ* conservation (Article 8)

Each Contracting Party shall, as far as possible and as appropriate

a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity;
b) Develop, where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity;
c) Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use;
d) Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings;
e) Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas;
f) Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, *inter alia*, through the development and implementation of plans or other management strategies;
g) Establish or maintain means to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health;
h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species;
i) Endeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components;
j) Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote the wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices;
k) Develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations;
l) Where a significant adverse effect on biological diversity has been determined pursuant to Article 7, regulate or manage the relevant processes and categories of activities; and
m) Cooperate in providing financial and other support for *in-situ* conservation outlined in subparagraphs (a) to (l) above, particularly to developing countries.

Box 3.7 The CBD: Measures for *ex-situ* conservation (Article 9)

Each Contracting Party shall, as far as possible and as appropriate, and predominantly for the purpose of complementing *in-situ* measures;

a) Adopt measures for the *ex-situ* conservation of components of biological diversity, preferably in the country of origin or such components;
b) Establish and maintain facilities for *ex-situ* conservation of and research on plants, animals and micro-organisms, preferably in the country of origin of genetic resources;
c) Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions;
d) Regulate and manage collection of biological resources from natural habitats for *ex-situ* conservation purposes so as not to threaten ecosystems and *in-situ* populations of species, except where special temporary *ex-situ* measures are required under subparagraph (c) above; and
e) Cooperate in providing financial and other support for *ex-situ* conservation outlined in subparagraphs (a) to (d) above and in the establishment and maintenance of *ex-situ* conservation facilities in developing countries.

objectives of the CBD via measures for integrated marine and coastal area management, the sustainable use of marine resources, issues relating to introduced species, mariculture and area protection. Contracting Parties to the CBD have discussed the ever

increasing threats to the marine environment beyond national jurisdiction and the urgent need to cooperate on a global scale for its protection (COP VII/5, paragraphs 29-62). COP decisions have covered the need to develop a protected area network that provides high levels of protection both within and beyond national jurisdiction (Decisions II/10; IV/5; V/3; VI/3; VII/5).

The COP has also established various advisory bodies and expert groups that have input into the programme and to assist in the formulation of recommendations. The Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) has highlighted the urgent need for the establishment of MPAs beyond national jurisdiction due to increasing risks to biodiversity (SBSTTA VIII/3), and has advised Contracting Parties to collaborate, cooperate and manage the establishment of high seas protected areas (SBSTTA IX/4). The Ad Hoc Technical Expert Group on Marine and Coastal Protected Areas has discussed the values and effects of marine and coastal protected areas and their role in sustainable development and use of marine resources. Adoption of the ecosystem approach is now accepted as the framework for action within the CBD. The Liaison Group on the Ecosystem Approach defines the ecosystem approach as:

> ...a strategy for management of land, water and living resources that promotes conservation and sustainable use in an equitable way.
>
> The aim of an ecosystem approach is to reach a balance of the three objectives of the Convention on Biological Diversity: conservation, sustainable use, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.
>
> An ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organisation which encompass the essential processes, functions and interactions among organisms and their environment, and among ecosystems. It recognizes that humans, with their cultural diversity, are an integral component of ecosystems (CBD Liaison Group on the Ecosystem Approach 1999).

The Liaison Group on the Ecosystem Approach has been developing guidelines and principles, improving scientific knowledge, and obtaining advice on the ecosystem approach (CBD Liaison Group on the Ecosystem Approach 1999). The Liaison Group emphasises adoption of the precautionary principle, and integration of traditional conservation approaches with the ecosystem approach.

Humans are an integral part of the ecosystem and are dependent upon biological diversity and its conservation and sustainable use. Use need not result in a loss of ecosystem function, and sustainable use can conserve habitats and species if

appropriately managed and providing that all stakeholders are involved (CBD COP XI 2002). Ecosystems are diverse and dynamic, hence adaptive management is necessary.

To date, the most comprehensive international instrument for environmental protection – terrestrial and marine – is the CBD. Since it also requires implementation of policy and actions for *in-situ* and *ex-situ* conservation at a national level, it has already had wide reaching impacts for global conservation. The CBD recognises that biological diversity and ecosystem functioning do not generally conform to political boundaries. There is a strong sense of stewardship, and the obligation to consider the conservation and sustainable use of the components of biodiversity apply irrespective of location. Obligations of Parties to the CBD are explicit and unambiguous. That the CBD and Jakarta Mandate also mention obligations in marine areas beyond national jurisdiction is a strength, and this can be enforced and controlled via flag state responsibility.

3.3.12 Agenda 21 (1992)

The United Nations soft-law instrument Agenda 21 was endorsed by 178 nations at the 1992 United Nations Conference on Environment and Development (UNCED) (http://www.un.org/esa/sustdev/documents/agenda21/index.htm, cited December 2004). The United Nations had 191 members as at March 2006. Agenda 21 emphasises the importance of cooperating with other States, organisations and intergovernmental bodies for the objectives of conservation and rational use of resources: Chapter 15 considers Biological Diversity (reinforcing many of the objectives of the CBD), whilst Chapter 17 recognises that the marine environment plays a vital role in the global life-support system whilst presenting opportunities for sustainable development (Agenda 21, para. 17.1). Chapter 17 will be outlined here, as it describes the basis of action for protection, rational use and development of the oceans and their living resources. Actions that States should adopt are divided into program areas as summarised in Box 3.8.

Traditional management of marine and coastal resources has not always proved to be sustainable and has been unable to prevent degradation of some marine areas (para. 17.3). Pollution of the marine environment from land-based sources constitutes 70% of marine pollution[23] and poses a significant threat to the marine ecosystem[24] (para's 17.18

[23] At the time of adoption of Agenda 21 in 1992.

Box 3.8 Agenda 21 (Chapter 17) Program Areas

A.	Integrated management and sustainable development of coastal areas, including exclusive economic zones (para's 17.3 to 17.17);
B.	Marine environmental protection (para's.18 to 17.43);
C.	Sustainable use and conservation of marine living resources of the high seas (para's 17.44 to 17.68);
D.	Sustainable use and conservation of marine living resources under national jurisdiction (para's 17.69 to 17.95);
E.	Addressing critical uncertainties for the management of the marine environment and climate change (para's 17.96 to 17.114);
F.	Strengthening international, including regional, cooperation and coordination (para's 17.115 to 17.122);
G.	Sustainable development of small islands (para's 17.123 17.136).

- 17.20). The high seas share of global fisheries activities comprised 5%[25] of world landings yet implementation, enforcement and monitoring has been inconsistent and ineffective[26] (para's 17.44 and 17.69). Climate change affects the marine environment, however scientific uncertainty exists regarding its source, impacts and extent (para 17.96). To address this deficiency baseline data are required in addition to an improved understanding of the role of oceans in climate change (para's 17.96 and 17.98). An integrated approach to marine conservation and sustainable use is necessary (para. 17.115). Small islands can have high biodiversity due to their geographic isolation however their small size renders them vulnerable to human pressures such as urban development, rising sea levels and climate change (para's 17.123 and 17.124). These issues provide the basis for the development of Chapter 17 of Agenda 21.

Within national jurisdiction States are encouraged to use protected areas to preserve critical habitat and protect biodiversity[27]. "States commit themselves to the conservation and sustainable use of marine living resources on the high seas" (para. 17.46). Beyond national jurisdiction, States are compelled to negotiate, participate in or ratify international law for management and conservation of marine mammals, fisheries and to control marine pollution (para's 17.47 to 17.55). Instruments referred to include the IWC, the LOSC (in particular with regard to straddling stocks and migratory species (para. 17.49)), MARPOL 73/78, RSAs and the ATS. The Antarctic is cited as a valuable "area for the conduct of scientific research, in particular research essential to understanding the global environment" (para. 17.104). States should discourage

[24] Impacts include toxicity, persistence and bioaccumulation (paragraphs 17.18 - 17.20)
[25] At the time of adoption of Agenda 21 in 1992.
[26] This is evidenced by overfishing, illegal and unregulated fishing, overcapitalisation, vessel re-flagging and unselective fishing gear that results in by-catch (paragraph 17.45)
[27] Particularly important areas identified include: Coral reef ecosystems; estuaries; temperate and tropical wetlands, including mangroves; seagrass beds; other spawning and nursery areas (paragraph 17.85).

reflagging of vessels and destructive fishing practices (para's 17.52 and 17.53). States should promote the adoption of appropriate technologies and methods, and allow for alternative employment if necessary. Agenda 21 outlines measures to be taken by States such as species inventories and area protection to ensure species biodiversity and productivity is maintained.

Status, Evolution and Analysis

Chapter 17 of Agenda 21 imposes a duty of care on the global community and advocates a precautionary rather than reactive approach to the conservation and sustainable use of the marine ecosystem. Agenda 21 has been widely adopted nationally and internationally in the form of Action Plans, hence it does have the potential to have widespread influence on the actions of the global community. For example, Agenda 21 led to the adoption of a Global Programme of Action for the Protection of the Marine Environment from Land-based Activities in 1995 (UNEP 1999). However, Agenda 21 is non-binding and only forms a hortatory basis for action. Therefore, unless States choose to implement its measures in national legislation, or until such time that Agenda 21 is adopted as part of (or the basis of) hard law, Agenda 21 is unlikely to have substantial conservation benefits, unlike comparable hard law instruments such as the CBD.

Despite this, under Agenda 21 States commit themselves to the conservation and sustainable use of marine living resources on the high seas, much like LOSC, and to participating in, formulating and adopting relevant international law. Agenda 21 compels States to involve all stakeholders and adopt integrated policies for management of marine resources, including promoting cooperation and collaboration with numerous instruments and bodies for the conservation and rational use of marine living resources, including IWC, LOSC, MARPOL 73/78, the RSA, the CBD and the instruments of the ATS.

3.3.13 The Food and Agriculture Organisation Fisheries Department

The FAO Fisheries Department's mandate is to promote the sustainable development of responsible fisheries management and to contribute to food security at a national, regional and international level. Mechanisms that assist in achieving this objective are developing international fisheries instruments and guidelines, and subsequently encouraging the adoption of these instruments by their members. The Fisheries

Department can also address issues relating to fisheries overcapacity and provide scientific or implementation advice to members. The Fisheries Department also encourages responsible fisheries and aquaculture to contribute to world food supplies and security; to reduce waste and discards, and promotes research and environmental rehabilitation. The Fisheries Department also has a key role in monitoring and analysing fisheries data (http://www.fao.org/fi/default_all.asp, cited March 2006).

Code of Conduct for Responsible Fisheries (1995)

CCRF is a voluntary, soft-law instrument that was adopted at the 28th Session of the FAO Conference on 31 October 1995. The CCRF is a comprehensive framework document that outlines principles and objectives that encourage the conservation, sustainable use and development of the fisheries industry. Within the CCRF are recommendations that apply to areas within national jurisdiction, but that extend to cover transboundary and high seas aquatic ecosystems. Article 6.1 says that "States and users of living aquatic resources should conserve aquatic ecosystems. The right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources". States and organisations should apply the precautionary approach (Articles 6.5 and 7.5), protect critical fisheries habitats (Article 6.8), and prevent unauthorised fishing in areas within and beyond national jurisdiction - and only then when compliant with national or international law (Article 7.6.2). The CCRF refers to various instruments such as LOSC, Agenda 21 and MARPOL 73/78 and states that the CCRF does not derogate from the rights and obligations of Parties under international law. The FAO furthermore provides numerous technical guidelines and advice on the measures to be taken for the conservation, management and development of fisheries (see http://www.fao.org/fi/Manage.asp, cited March 2006).

The Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (the Compliance Agreement) was approved on 24 November 1993 by Resolution 15/93 of the 27th Session of the FAO Conference. An integral part of the CCRF and representing one of the first steps for Parties to undertake under the CCRF, the Compliance Agreement entered into force on 24 April 2003 upon receipt of the 25th instrument of acceptance. Unlike the CCRF, the Compliance Agreement is hard-law. As at March 2006 there were 33 Parties to the Agreement. The Compliance Agreement recognises that while States

have a right to fish on the high seas they also have a duty to take measures for the conservation and sustainable use of its living resources (preamble). The Compliance Agreement reiterates many of the measures and objectives set forth in the LOSC and applies to all vessels fishing on the high seas (Article II). Contracting Parties must ensure that any vessels flying their flag do not undermine the effectiveness of international measures for the conservation and management of high seas living resources (Article III.1). Permits to fish on the high seas may only be issued to vessels that are believed to be able to fulfil their responsibilities under the Compliance Agreement (Article III.2 and 3). Flag States must monitor, report and enforce fishing activities by their nationals (Article VI.8). Hence, although the CCRF is a soft-law agreement, the Compliance Agreement is a hard-law instrument that consolidates and strengthens the measures already in place under international law and ensures that Contracting Parties to the Compliance Agreement abide by the guidelines described in the CCRF.

Status, Evolution and Analysis

The CCRF is soft law, a framework instrument that aims to encourage the conservation, sustainable use and development of the fisheries industry. The Compliance Agreement is an integral part of the CCRF, but is in fact a hard law instrument that has great potential in contributing towards the conservation and sustainable use of marine living resources. The Compliance Agreement asserts that whilst States have the right to fish on the high seas, they also have a duty for its conservation and sustainable use. The CCRF has not as yet received widespread adoption, with just 33 Contracting Parties.

International Plans of Action

Many of the measures to be implemented under the CCRF are further elaborated in FAO International Plans of Action (IPOAs) (see http://www.fao.org/fi/agreem/agreem.asp, cited March 2006), such as the 2001 IPOA to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) (FAO 2001) and its technical guidelines (FAO Fisheries Department 2002), and the IPOA-Seabirds (Rivera 2000). These soft law instruments provide more detail regarding how to implement the objectives of the CCRF at a national level.

The IPOA-IUU aims to prevent, deter and ultimately eliminate IUU fishing by providing States with measures that comply with international law (Section III.8).

Section III of the IPOA-IUU outlines the aims and principles of the IPOA-IUU. States are urged to implement the IPOA independently or cooperatively (via National Plans of Action – NPOA) and to ensure effective consultation and involvement with other States and FMOs. States are obliged to consider social, economic and environmental impacts of IUU fishing, and to adopt a comprehensive approach to implement IPOAs at a national, regional or global scale as warranted. States should manage, monitor and enforce all aspects of fisheries including Port State, Coastal State and market-based measures to deter IUU fishing. States should create national legislation, exercise controls over IUU fishing and impose sanctions for non-compliance by its nationals (Section IV). Perverse incentives for vessels engaged in IUU fishing should be avoided. Member States are to encourage compliance by vessels without nationality or non-member States engaging in IUU fishing on the high seas. Importantly, all measures taken in meeting obligations under IPOA-IUU should encourage the conservation and long term sustainable use of fish stocks and the environment. States are encouraged to sign, ratify and implement international agreements such as LOSC, the CCRF and its related agreements and IPOAs (Section IV). States fishing on the high seas that are not members of the relevant FMOs are encouraged to comply with LOSC as it relates to high seas living resources (Section IV.15).

The IPOA-Seabirds was developed in recognition of concerns that commercial longlining has resulted in seabird by-catch, and may also impact on fishing productivity and profitability (preamble). The aim of the IPOA-Seabirds is to create effective measures for reducing seabird by-catch resulting from longlining (para. 10). The IPOA-Seabirds applies globally where longlining is undertaken, but notably (for this research) targets Southern Ocean Patagonian toothfish fisheries where a major problem of albatross and petrel by-catch is evident. The IPOA-Seabirds highlights measures already taken in 1992 by CCAMLR, additionally citing the initiatives of other States and FMOs (preamble). The IPOA-Seabirds is a voluntary instrument that applies to States or their nationals engaging in longlining either within their EEZ, another State's EEZ or the high seas (paragraphs 8 and 9). States are encouraged to conduct an assessment of their by-catch issues (cooperating internationally and with appropriate FMOs) and to develop appropriate NPOA and mitigation measures (para's 11 to 17). Cooperation and revision of the implementation and effectiveness of IPOA-Seabirds should also be undertaken regularly to encourage - at an international scale - the ongoing reduction of by-catch

(para's 18-21). Support and technical documentation is provided by the FAO to assist States in the implementation of the NPOA. The IPOA-IUU and IPOA-Seabirds reinforce the CCRF, complementing and strengthening the duties of States both within national jurisdiction (e.g. coastal controls over fisheries) and beyond national jurisdiction (e.g. by discouraging reflagging of non-nationals) to ensure the long term viability of fisheries and the marine environment, and a reduction of the negative effects of fisheries that result in by-catch.

Status, Evolution and Analysis

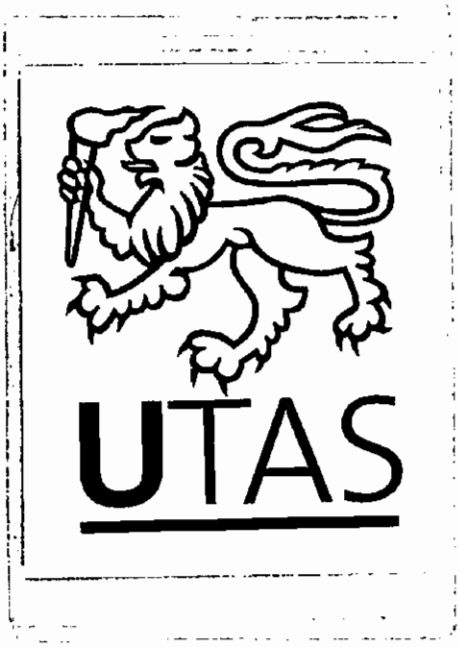
The obligations of States under the CCRF are complemented by the FAO's IPOAs, which are soft law and provide an action plan for nationals to implement at a State level. The two most significant IPOAs for the Southern Ocean are the IPOA-IUU fishing, and the IPOA-Seabirds. IUU fishing poses a major threat to Antarctic marine living resources, and the IPOA-Seabirds address threats posed to birds as by-catch resulting from longlining. The CCAMLR Commission has been a key player in the development of the IPOA-Seabirds and the IPOA-IUU fishing, and has actively encouraged States to adopt the plans.

3.4 Summary

This chapter has described some of the key international instruments and organisations that are working towards the conservation and sustainable use of the world's resources, and in particular, the world's marine living resources. The purpose of this chaprer was to describe the global instruments that may apply to the high seas, and assess their appropriateness and applicability to the Antarctic[28]. It also demonstrates that although the environmental movement has progressed substantially over the past few decades, most instruments and organisations have been formed in response to environmental damage at varying scales. They have largely been reactive, not proactive. The latest instruments have made attempts to pre-empt further unforeseen environmental damage in an effort to ensure the conservation and sustainable use of the world's resources for future generations. The growing cooperation between organisations and linkages between instruments reinforces the global effort towards conservation and sustainable

[28] There are also numerous regional instruments that reinforce many of the principles and objectives set forth in international law. It is beyond the scope of this research to consider all such instruments here; examples include, *inter alia*, Natura 2000; the EU Habitats Directive; and the Arctic Environmental Protection Strategy.

use and, as will be explored in the next chapter, the same progression of ideas has been evident in the Antarctic region.



Chapter 4

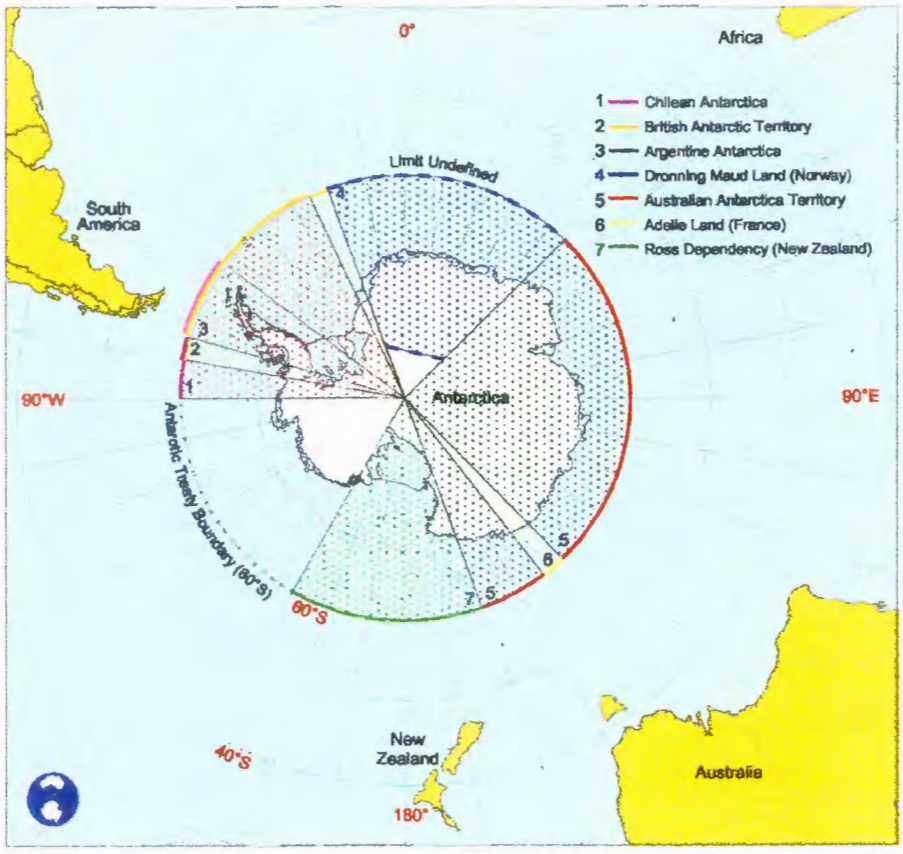
4 HISTORY AND CONSERVATION IN THE ANTARCTIC

4.1 Exploration and Exploitation

In the late 18th century, Captain James Cook hypothesised the existence of a great southern land, and explorations in the 1820s verified the existence of the Antarctic. Motivation to explore the Antarctic was driven by two main interests: empire building and scientific research. It has even been suggested that empire building was often done under the guise of scientific research (Beck 1986). Sealing operations were a key commercial focus in the region, often the impetus for territorial discoveries and claims, and over the next 150 years or so countries strived to extend their empires and lay claim to the perceived riches and strategic position of the region. The seven original claimants (some with overlapping claims) were Argentina, Australia, Chile, France, New Zealand, Norway and the United Kingdom (UK) (Figure 4.1). Since Antarctica had no indigenous population, States were fiercely competitive in demonstrating their presence in the Antarctic. A physical presence was seen to bolster a nation's territorial claim, so the period around World War II saw the establishment of numerous scientific stations in Antarctica (Beck 1986). In the meantime, human occupation of the Antarctic territory was making its presence felt, particularly on the marine living resources of the region.

4.1.1 Antarctic Resources: A History of Exploitation

The Antarctic has a strong history of resource exploitation not unlike the rest of the world. In the 18th century fur seals were exploited to critical levels as a source of food and oil. The near extinction of fur seals in South Georgia in 1786 led to a refocus of activity towards elephant seals in the 19th century (CCAMLR Commission 2003). By the 1820s, all of the major seal species in the South Atlantic were near exhaustion (US Department of State 2002). Commercial whaling commenced at South Georgia in 1904, and the use of whale oil in materials for World War I increased the perceived value of the region and its resources. Whaling operations progressively exhausted stocks in the same way that had occurred with Antarctic seals. Even birds and their eggs were targeted as a source of food and oil (CCAMLR Commission 2003).



Source: Australian Antarctic Division (2000)

Figure 4.1 Territorial Claims in Antarctica

In the second half of the 20th century, technical advances were facilitating exploitation of Antarctic marine living resources at unprecedented levels. In the mid-1960s Antarctic finfish and krill were being targeted, and by the 1970s a large-scale commercial fishery was established in the Southern Ocean. Trawlers fished for *notothenüds*, lantern fish and ice fish, and by the mid 1980s longliners moved into the region to harvest Patagonian toothfish (*Dissostichus eleginoides*). In 1997 around 3.2 million tones of finfish were harvested from the Southern Ocean (CCAMLR Commission 2003). These fisheries were also having an impact on non-target species, in particular longlining was increasingly being implicated in the incidental mortality of albatross and petrel species which became entangled in fishing gear (CCAMLR Commission 2003). An increase in the exploration and exploitation of Antarctic krill (*Euphasia superba*) occurred in the

1970s, and in the 1980s Southern Ocean fisheries began to be heavily regulated by the CCAMLR Commission (CCAMLR Commission 2003).

4.1.2 Conflict and Collaboration

The early phase of exploration and scientific research was generally characterised by legal and political conflict that peaked in the 1940s and 1950s. There were 67 States involved in the 1957 International Geophysical Year (IGY), 12 of which were active in the Antarctic. The IGY saw these 12 States put aside their differences regarding territorial disputes and work together in their scientific endeavours (Beck 1986). The collaboration involved the seven original Antarctic claimants (Figure 4.1), plus Belgium, Japan, South Africa, the Soviet Union and the United States of America (USA). The IGY allowed Antarctic science to progress at an unprecedented rate. States involved saw the benefits of their cooperation and feared a return of the old tensions as the IGY drew to a close. There were also fears that the Cold War, military and nuclear activities could influence Antarctic politics at the expense of science (Beck 1986). So, at the invitation of the USA, the 12 active states in the Antarctic participated in a diplomatic conference in Washington and created the 1959 Antarctic Treaty (Beck 1986, US Department of State 2002). Antarctic Treaty negotiations represented an early example of the international community's ability to set aside political and legal contentions in pursuit of peace and science (Beck 1986).

4.2 The Antarctic Treaty

The Antarctic Treaty was negotiated over the year following the IGY in a series of 60 meetings. Formal negotiations were held between 15 November and 01 December 1959, when the text was finalised and signed by the 12 participating States. The Antarctic Treaty entered into force on 23 June 1961 (Beck 1986). As at March 2006, the Antarctic Treaty had 45 Contracting Parties[1], 28 with Consultative (decision-making) status (see Table 4.1). States that accede to the Treaty[2] can become Antarctic Treaty Consultative Parties (ATCPs) whilst they are undertaking "substantial research" in Antarctica (Article IX). Contracting Parties are bound by the conditions of the Treaty but do not have decision-making status unless they are ATCPs. All decision-making,

[1] Antarctic Treaty Contracting Parties include all signatories to the Antarctic Treaty, including ATCPs. Where measures or rights specifically apply only to ATCPs, the text shall refer to ATCPs.

[2] Accession is open to all States that are members of the United Nations, or by invitation of the ATCPs (Article XIII.1)

Table 4.1 Participating States to the Antarctic Treaty

No.	State Signatories	Original Signatory	Claimant State	Consultative Party (ATCP)
1	United Kingdom	X	X	X
2	South Africa	X		X
3	Belgium	X		X
4	Japan	X		X
5	United States of America	X		X
6	Norway	X	X	X
7	France	X	X	X
8	New Zealand	X	X	X
9	Russia (a)	X		X
10	Poland			X
11	Argentina	X	X	X
12	Australia	X	X	X
13	Chile	X	X	X
14	Czech Republic (b)			
15	Slovak Republic (b)			
16	Denmark			
17	Netherlands			X
18	Romania			
19	Brazil			X
20	Bulgaria			X
21	Germany (c)			X
22	Uruguay			X
23	Papua New Guinea			
24	Italy			X
25	Peru			X
26	Spain			X
27	China, People's Republic of			X
28	India			X
29	Hungary			
30	Sweden			X
31	Finland			X
32	Cuba			
33	Korea, Republic of			X
34	Greece			
35	Korea, Democratic People's Republic of			
36	Austria			
37	Ecuador			X
38	Canada			
39	Colombia			
40	Switzerland			
41	Guatemala			
42	Ukraine			X
43	Turkey			
44	Venezuela			
45	Estonia			
	TOTAL	12	7	28

(Adapted from ATS Home Page, http://www.ats.aq/membership_signatories.php, cited Dec 2005)

(a) Former Soviet Union.

(b) Formerly part of Czechoslovakia.

(c) Also known as the Federal Republic of Germany, encompassing the former German Democratic Republic.

amendments and additions to the Antarctic Treaty must be made by consensus (Article XIII).

The Antarctic Treaty applies to the entire region south of 60° South (the Treaty Area) (Article VI), but does not affect the rights or obligations of any States under international law with regard to the high seas. Under the Antarctic Treaty, the region was to be a place of peace (Article I), science and cooperation (preamble, Articles II and III). The status of territorial sovereignty in the Antarctic was addressed by freezing territorial claims for the duration of the Antarctic Treaty (Article IV.1 and IV.2). This is often referred to as the gentleman's agreement, since Contracting Parties agreed to disagree about the status of territorial claims (Beck 1986, Vidas 2000). The Antarctic Treaty bans nuclear explosions and nuclear waste disposal within the Treaty Area (Article V).

Contracting Parties have a number of obligations under the Antarctic Treaty including the exchange of information, scientific personnel, observation and results (Article III.1). Contracting Parties can designate observers to conduct and report on inspections anywhere in the Treaty Area to ensure that activities are carried out in a manner consistent with the principles of the Treaty (Article VII and IX.3). Contracting Parties are further obliged to exert their influence to see that no-one acts in contravention of Treaty principles and purposes (Article XI). In the event of a dispute, Contracting Parties are encouraged to cooperate with each other to find a peaceful resolution (Articles VIII.2 and Article XI.1), deferring to the International Court of Justice only in cases where the dispute cannot be resolved (Article XI.1).

ATCMs are held regularly for Contracting Parties to exchange information and to discuss, formulate and recommend measures to further the principles of the Treaty (Article IX.1). Measures developed should (Article IX.4):

a) ensure the use of Antarctica for peaceful purposes only
b) facilitate scientific research
c) encourage international cooperation
d) allow for the exercise of the rights of inspection
e) address questions relating to the exercise of jurisdiction in Antarctica
f) enhance the preservation and conservation of living resources

Contracting Parties have met on a regular basis since the entry into force of the Antarctic Treaty. ATCMs were initially held every two years and attended only by ATCPs. Meetings are now held annually and attendees include delegations of all Contracting Parties and other invited observers. Despite this, ATCPs retain decision-making power whilst other Contracting Parties have observer status (see following section). Numerous measures and instruments have since been created to address Article IX of the Antarctic Treaty, as well as other newly emerging issues.

4.2.1 Status, Evolution and Analysis

Beck (1986) argued that the Antarctic Treaty had several shortcomings when he stated:

> During the 1960s the Agreed Measures were drafted to deal with the treaty's shortcomings in the sphere of environmental protection, and subsequently perceived deficiencies in respect to living resources led to the 1972 Seals Convention and the 1980 CCAMLR (Beck 1986: 315).

The Treaty does not in itself set out to protect the Antarctic environment and its living and mineral resources. Instead the Treaty enables the creation of other instruments/measures so is able to evolve with time to meet the changing needs of those concerned with the Antarctic (Kimball 1985), as outlined in Article IX of the Antarctic Treaty. And evolve it has, to become one of the most enduring, comprehensive and adaptive international instruments today, as evidenced by the fact that the 30 year review that was prescribed in Article XII.2(a) did not eventuate. The vision of the 1959 Antarctic Treaty has to date maintained the Antarctic as an essentially peaceful continent where international cooperation in science and conservation has, overtly at least, taken primacy over geo-political concerns and resource exploitation. There are no measures within the Treaty that apply to species, *in-situ* or *ex-situ* conservation, but Article IX specifies that measures should be created to, *inter alia*, preserve and conserve Antarctic living resources (Article IX-1).

Over time the agenda at ATCMs has been influenced by internal and external factors. In the 1970s and 1980s ATCMs were characterised by discussions on the conservation and rational use of Antarctic marine living resources, and the potential exploration and exploitation of Antarctic mineral resources. The 1970s saw the rise of the environmental movement and the early stages in the development of international environmental law (Beck 1986). The world resource crisis, as evidenced by widespread fisheries collapse and resource shortages, was on the agenda in the 1980s (Beck 1986, UNEP 2002). This led to a renewed interest in the Antarctic which represented a largely untapped pool of

resources but was also a place where the question of sovereignty had never been resolved (Sahrhage 1985, Beck 1986). The extension of territorial seas to 200 nautical miles under the LOSC heightened the sovereignty debate in the Antarctic (Mitchell 1985). Technological advances enabled fisheries to reach and exploit previously inaccessible areas such as the Southern Ocean. These factors presented ATCPs with the prospect of unprecedented pressures on Antarctic resources, and contributed towards the evolution of the ATS.

ATCPs also came under scrutiny in the 1970s and 1980s, when the ATS was criticised for being elitist and unrepresentative of the international community (Mitchell 1985, Beck 1986). Various non-Treaty Parties[3], particularly developing nations and NGOs, argued for a more open Treaty System, a greater presence of observers at ATCMs, and even for a replacement of the Antarctic Treaty itself (Mitchell 1985, Beck 1986). The question of sovereignty was reignited as some non-Treaty Parties, such as Malaysia, argued that Antarctica was the "common heritage of mankind". The United Nations was being called on to intervene regarding 'The question of Antarctica' and its governance, and subsequently undertook a comprehensive study of Antarctica in 1984 (Mitchell 1985, Beck 1986, Beck 2004). ATCPs responded to this pressure by making the ATS more transparent: In 1983 acceding States were granted observer status at ATCMs (rather than just ATCPs), and NGOs were increasingly included within national delegations at ATCMs (Kimball 1985). Significantly, developing countries such as India and China acceded to the Treaty and became ATCPs very quickly, in the case of India in a period of less than one month. A motivating factor to acceding States was involvement in the development and potential benefits of the Convention on the Regulation of Antarctic Mineral Resources Activities (CRAMRA).

The ATS is defined in Article 1 of the Madrid Protocol as "...the Antarctic Treaty, the measures in effect under that Treaty, its associated separate international instruments in force and the measures in effect under those instruments". The international instruments that form part of the ATS are the Agreed Measures, CCAS, CCAMLR and the Madrid Protocol. The following section considers each of these instruments as they evolved to become an integral part of the ATS. The status of the instruments still in force today is described in Table 4.2. The key characteristics of each instrument are

[3] Also known as third-Party States.

described, with particular reference to the conservation and preservation of Antarctic marine living resources[4].

4.3 1964 Agreed Measures

At ATCM I (1961) ATCPs recognised the need to protect Antarctic living resources in order to fulfil their obligations under Article IX.1(f) of the Antarctic Treaty. The topic was placed on the agenda for consideration at the next meeting (Recommendation I-8(i) and (iv)). In the meantime ATCPs acknowledged the need for caution, and agreed to follow the SCAR General rules of conduct for the preservation and conservation of living resources in Antarctica (Recommendation I-8(v))[5]. In 1962 Recommendation II-2 resolved to produce a draft text of measures to be presented at the next ATCM. The Agreed Measures were subsequently adopted in 1964 at ATCM III (Recommendation III-8). Recommendation III-9 stipulated that until such time that the Agreed Measures became effective under Article IX of the Antarctic Treaty, that they should be considered as guidelines. Hence, the provisions of the Agreed Measures were followed as hortatory guidelines[6] until they were superseded by the Madrid Protocol (see Section 4.3.4).

The Agreed Measures referred to the Antarctic as a "Special Conservation Area" (preamble) and recognised the scientific value of Antarctic fauna and flora, and the need for their protection, scientific study and rational use (preamble). The Agreed Measures applied to the Treaty Area (Article I.1), and as with the Antarctic Treaty, the provisions within the Agreed Measures did not derogate from the rights and obligations of nationals within the high seas (Article I.2). The Agreed Measures were consistent with the Antarctic Treaty in encouraging information exchange (Article XII) and compliance to measures by personnel and ships active in the Antarctic (Articles X and XI). However, in the case of extreme emergencies the Agreed Measures did not apply (Article V). Contracting Parties faced a number of obligations when conducting

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[4] It is beyond the scope of this study to consider these instruments in full detail. This study considers strategies for Antarctic marine conservation, thus emphasis is be placed on provisions within the ATS for the conservation of Antarctic marine living resources.

[5] References to the Antarctic Treaty Consultative Meetings (including recommendations, measures, resolutions and decisions) between 1961 and 2002 are obtained from: US Department of State (2002) Handbook of the Antarctic Treaty System. Ninth Edition, July 2002, Vol. US Department of State, Washington DC

[6] At ATCM IV in 1966, the adoption by Parties of the Agreed Measures as guidelines was reiterated (Recommendation IV-20).

Table 4.2 States Signatories to the Instruments of the ATS

State/Signatory	Antarctic Treaty	CCAS	CCAMLR*	Madrid Protocol
Argentina	X	X	X	X
Australia	X	X	X	X
Austria	X			
Belgium	X	X	X	X
Brazil	X	X	X	X
Bulgaria	X		X	X
Canada	X	X	X	X
Chile	X	X	X	X
China, People's Republic of	X			X
Colombia	X			
Cuba	X			
Czech Republic	X			X
Denmark	X			
Ecuador	X			X
Estonia	X			
European Community			X	
Finland	X		X	X
France	X	X	X	X
Germany	X	X	X	X
Greece	X		X	X
Guatemala	X			
Hungary	X			
India	X		X	X
Italy	X	X	X	X
Japan	X	X	X	X
Korea, Democratic People's Republic of	X			
Korea, Republic of	X		X	X
Mauritius			X	
Namibia			X	
Netherlands	X		X	X
New Zealand	X	(X)	X	X
Norway	X	X	X	X
Papua New Guinea	X			
Peru	X		X	X
Poland	X	X	X	X
Romania	X			X
Russia	X	X	X	X
Slovak Republic	X			
South Africa	X	X	X	X
Spain	X		X	X
Sweden	X		X	X
Switzerland	X			
Turkey	X			
Ukraine	X		X	X
United Kingdom	X	X	X	X
United States of America	X	X	X	X
Uruguay	X		X	X
Vanuatu			X	
Venezuela	X			

X – signed and ratified (X) – signed and not ratified *CCAMLR allows for non-State signatories

activities in the Antarctic under the Agreed Measures, including:

- the protection of native fauna

- the prevention of harmful interference
- the establishment of protected areas
- restrictions relating to introduced species
- scientific cooperation and information exchange

The killing, wounding, capturing or molesting of native mammals and birds was prohibited under the Agreed Measures, except in accordance with a permit (Article VI.1). Mammals and birds were also protected by Article VII, which called upon Parties to minimise harmful interference with their natural living conditions (Article VII.1). Details of activities that constituted harmful interference were outlined in Article VII.2, which imposed restrictions on activities around bird or seal concentrations, particularly during breeding season. Permits could be issued to provide indispensable food (Article VI.2(a)) or specimens for scientific study or educational display such as in museums (Articles VI.2(b) and (c)). When issuing permits nationals had to ensure that no more animals were taken in any year than could be replaced by natural reproduction (Article VI.4(a)), whilst maintaining species diversity and the ecological balance within the Treaty Area (Article VI.4(b)). Article VI.5 had provisions for the designation of Specially Protected Species (SPSs). Any species designated as SPSs were listed in Annex A, which included the genus *Arctocephalus* (fur seals) (Recommendation IV-16), and *Ommatophoca rossi* (Ross seals) (Recommendation IV-17). Permits relating to SPS could be issued for scientific research providing that the ecological integrity of the system and species was maintained (Article VI.7(a) and (b) respectively). Parties were even obliged to alleviate pollution in waters surrounding coasts and ice-shelves (Article VII.3).

Article VIII facilitated the creation of Specially Protected Areas (SPAs) for the preservation of the natural ecological systems of areas of "outstanding scientific interest" (Article VIII.1)[7]. SPAs were subject to a higher level of protection than elsewhere in the Antarctic. Vehicles could not be driven within a SPA, and the collection of native plants was prohibited unless a permit stipulated otherwise (Article VIII.2(a) and (b)). Entry into a SPA required a permit, which could only be issued for "compelling scientific purposes" unable to be served elsewhere (Article VIII.4(a)), and

[7] Prior to the Agreed Measures, Treaty Parties recognised the need to preserve and protect historic sites in Antarctica (including tombs, buildings or objects) (Recommendations I-IX and V-4). In 1972 a list of 43 historic monuments was created for this purpose, appended to Recommendation VII-9.

providing that the natural ecological system of the area was not jeopardised (Article VIII.4(b)). The first 15 SPAs were proposed in 1966 (Recommendations IV-1 through IV-15).

Article IX recognised the vulnerability of the Antarctic to introduced species. The importation of non-indigenous fauna and flora required a permit (Article IX.1). A list of permitted introductions was included in Annex C, and included sledge dogs and laboratory species providing they were strictly supervised (Article IX.2). Imports of food were exempt, including animals, providing they were kept under controlled conditions (Article IX.3). Contracting Parties were obliged to take precautions to prevent unnecessary introductions of parasites and diseases (Article IX). Annex D outlined these precautionary measures, which included the inoculation of dogs against disease, and prohibited the import of live poultry after 01 July 1966 (Annex D-1 and 2).

4.3.1 Status, Evolution and Analysis

In 1972 ATCPs noted the advice of SCAR (SCAR 1972) that the existing network of SPAs was "not fully representative of all major Antarctic land and freshwater ecological systems and that...some are over-represented" (Recommendation VII-2). ATCPs created a list of ecosystems to be included in the network of SPAs (Recommendation VII-2 para. 1):

a) representative examples of the major Antarctic land and freshwater ecological systems
b) areas with unique complexes of species
c) areas which are the type locality or only known habitat of any plant or invertebrate species
d) areas which contain especially interesting breeding colonies of birds or mammals
e) areas which should be kept inviolate so that in the future they may be used for purposes of comparison with localities that have been disturbed by man

Contracting Parties were also encouraged to keep the number and size of sites to a minimum to enable meeting the objectives set out in Recommendation VII-2, paragraph 1 (Recommendation VII-2, para's 3 and 4). A new protected area classification, Sites of Special Scientific Interest (SSSIs), was proposed at the 1972 ATCM to protect sites of scientific value against accidental or wilful interference (Recommendation VII-3). These

sites required a management plan to regulate activities and specify a period of designation. A new area classification, Areas of Special Tourist Interest (ASTI), was proposed under Recommendation VIII-9, however no sites were ever designated (Stonehouse 1994). In the mid-1970s SCAR was asked to suggest appropriate sites for designation and undertake a review of the protected area system (PAS), which led to the development of the 1977 SCAR Ecosystem Matrices (Appendix 3). The Matrices were designed to identify gaps in the species, habitat and spatial coverage of the Antarctic PAS, and to provide a framework for the development of a 'systematic geographic-environmental framework'. The three matrices covered terrestrial, marine and inland water ecosystems (SCAR 1977).

SCAR had an important role to play in the evolution of the Antarctic PAS over the next two decades, providing advice on the need for possible new protected area categories. At ATCM XIV, ATCPs discussed SCAR's proposed improvements to the Antarctic PAS, which included (ATCM XIV, para's 77-96):

- improved management of protected areas
- assessment of the success of management plans in meeting site designation objectives and protecting the values of the site
- reporting and information management
- better site selection to create a geographically representative PAS
- the need for additional protected area categories to improve coverage

Several changes to the PAS followed. At ATCM XIV (1987) some ATCPs argued that the existing provisions of the Agreed Measures did not cater for marine sites of scientific value (ATCM XIV, para. 89), so a new classification, Marine Sites of Special Scientific Interest (MSSSIs), was voluntarily adopted under Recommendation XIV-6. At the next ATCM in 1989 ATCPs voluntarily adopted the management plan for yet another two types of protected areas proposed by the USA: the Specially Reserved Area (SRA) (Recommendations XV-10) and Multiple-Use Planning Area (MUPA) (Recommendation XVI-11). SRAs were for the protection of areas of outstanding geological, glaciological, geomorphological, aesthetic, scenic or wilderness value, and required a permit for entry. MUPAs were to be applied in areas where coordination of planned activities would minimise harmful interference or cumulative impacts on the area being protected, and required a management plan. Management plans were

acknowledged as having value in assisting in the planning and coordination of activities in protected areas. Over time, additional details were recommended for inclusion in management plans (Recommendation VIII-3)[8], and in 1989 ATCPs agreed to introduce a management requirement for SPAs, again increasing the detail to be included in management plans (Recommendation XV-9). These new measures aimed to improve site management and protection.

The Agreed Measures represented significant progress in the preservation and conservation of living resources in the Antarctic, reinforced by subsequent recommendations adopted by Treaty Parties. Recommendation IV-18 encouraged Parties to cooperate to reduce the number of permits issued (and therefore impacts) under the Agreed Measures. Recommendation IV-19 encouraged information exchange and common reporting standards amongst Parties, also advocating SCAR's involvement in reporting on the status of Antarctic species, their need for protection and advice on appropriate permit conditions. Yet the agenda at ATCMs soon reflected the fact that in some cases Antarctic fauna and flora were in need of even greater levels of protection than these measures provided.

4.4 1972 Convention for the Conservation of Antarctic Seals

The history of sealing and whaling in the Antarctic had demonstrated the vulnerability of Antarctic wildlife to uncontrolled commercial exploitation. Since sealing operations largely occurred in the high seas, they were beyond the scope of the Agreed Measures. At ATCM IV Treaty Parties adopted the Interim Guide Lines for the Voluntary Regulation of Antarctic Pelagic Sealing (Recommendation IV-21), having discussed their concerns regarding species survival and ecological balance at ATCM III (Recommendation III-XI). Contracting Parties recognised the need for an international convention to regulate activities of Treaty Parties and non-Treaty Parties (Recommendations IV-21, V-7 and V-8). A series of meetings followed, and at ATCM VI (1970), the text was drafted based largely on the original guidelines. The text for CCAS was finalised at the conference on the Conservation of Antarctic Seals, and opened for signature on 01 June 1972. CCAS entered into force on 11 March 1978 (US Department of State 2002). Accession was permitted by any State at the invitation of all

[8] Management plans would now provide more detail regarding the site description and reasons for its designation, acceptable activities within the SSSI, access points, including pedestrian and vehicular routes, and any restrictions or guidelines to be followed (see Recommendation VIII-3, para. 1(c)(i) to (ix)).

ATCPs, and there were 16 Contracting Parties in March 2006 as outlined in Table 4.2 (New Zealand has signed but not yet ratified CCAS).

CCAS embraces the concepts of cooperation, information, reporting and data exchange (Article 5, Annex). SCAR is charged with the role of monitoring compliance and providing advice on measures (Article 4.4, Article 5.4 to 5.6). The Convention applies to the seas south of 60° S (Article 1.1), and like the Agreed Measures, promotes seal protection, study and rational use, the maintenance of ecosystem balance (preamble)[9]. CCAS applies to Contracting Parties, their nationals and any vessels flying under their flags, and prevents the killing or capture of seals[10] except in accordance with the provisions of the Convention (Article 2.1). Contracting Parties must implement CCAS by the adoption of appropriate measures and a permit system (Article 2.2).

Measures to be adopted by Parties include: species restrictions (permissible catch, size, sex, age or protection level); area restrictions (open/closed seasons or areas; designation of special areas where no disturbance may occur); or other restrictions (gear, methods, reporting, inspections). Details regarding these measures are outlined in the Annex to CCAS, which may be updated or modified based on the best scientific knowledge available (Article 3). Of particular interest is the designation of the Ross seal, Southern elephant seal (*Mirounga leonina*) and the genus fur seal as Protected Species (para. 2.(a)). Six sealing zones were defined within which sealing operations are permitted in accordance with the Annex (Annex, para. 4). CCAS Seal Reserves are key breeding sites or sites of long-term scientific research within which killing or capture of seals is prohibited: three Seal Reserves are listed (Annex, para. 5). Under Article 4.1, permits may be issued to provide for the killing or capture of seals for indispensable food, scientific research or specimens.

4.4.1 Status, Evolution and Analysis

CCAS remains in force today and no resumption of commercial sealing is anticipated. At a review of the operation of CCAS in London, September 1988, SCAR noted that based on catch levels (i.e. the incidental take from scientific research and other activities)

[9] It is important to note that CCAS protects seals at sea, and does not apply to seals when they are on land or ice unless the seals are located within a Seal Reserve.

[10] The species covered by CCAS are: Southern elephant seal (*Mirounga leonina*), Leopard seal (*Hydrurga leptonyx*), Weddell seal (*Leptonychotes weddelli*), Crabeater seal (*Lobodon carcinophagus*), Ross seal (*Ommatophoca rossi*); Southern fur seals (*Arctocephalus* sp.) (Article 1.2)

there was no evidence of harmful impacts on either species stock levels or the ecological balance of the localities concerned (US Department of State 2002, para. 12). CCAS was deemed to have been 'reasonably satisfactory' in its operation (Anon. 2002, para. 15), with a few areas for improvement identified. These related to the ongoing review of the Annex to reflect improved information and understanding of seal ecology, in particular revising Protected Species, sealing zones and catch limits.

CCAS does not address the possible interactions with other instruments of the ATS, or international law, however CCAS was formulated prior to the other instruments of the ATS (with the exception of the Agreed Measures), which could explain this deficiency. There is no mention as to how CCAS may interact with other international instruments that regulate high seas activities – not even ICRW which was concluded prior to CCAS. Its measures only apply to CCAS State signatories, of whom there are only 16, however accession is open to any State by invitation of the Contracting Parties. Whilst CCAS alludes to ecosystem balance, there is no mention of dependent or associated species in Article 5 (or associated measures), therefore it cannot be interpreted as taking a pure ecosystem approach. CCAS makes no mention of the precautionary approach, although it does address and attempt to manage seal stocks to ensure that no more than the maximum sustainable yield is taken. SCAR has a role in monitoring, reporting and addressing any circumstances where this level is exceeded, and amendments to the text of the Convention (and its Annex) must be based upon best scientific advice available.

CCAS was a reactionary instrument that has been relatively successful in the management and conservation of Antarctic seals within the Treaty area. That seals are not protected on land or ice (unless in a protected area or they are a protected species) is a flaw in the Convention; so too is the lack of protective measures for dependent and associated species. Whilst CCAS was recognised for its protection of Antarctic seals, it did not resolve all issues regarding the vulnerability of Antarctic marine living resources. However, more recent instruments of the ATS have been substantially more successful and progressive in their approach to Antarctic marine conservation, and CCAMLR in particular set a new standard for international marine conservation efforts.

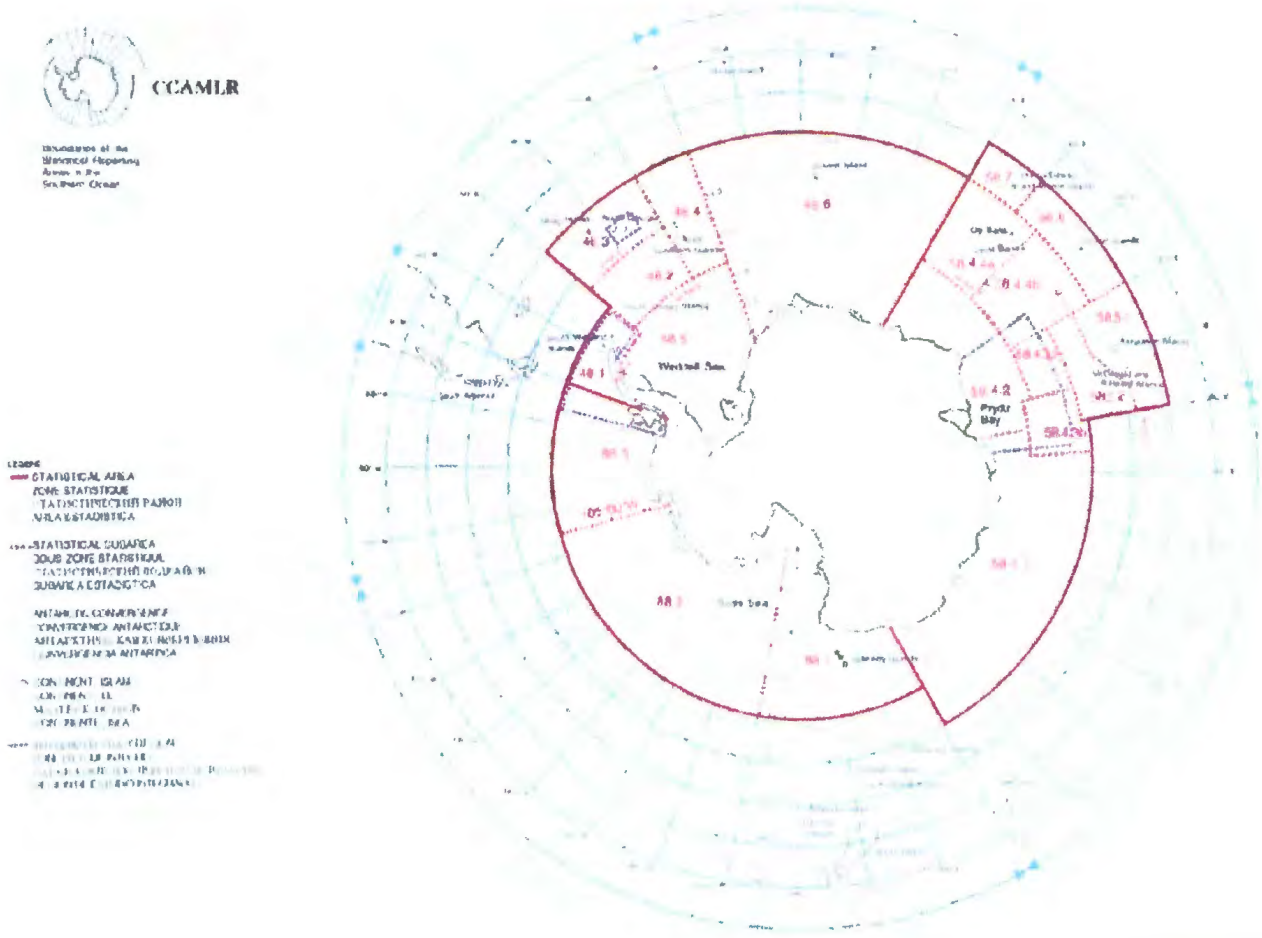
4.5 The 1980 Convention on the Conservation of Antarctic Marine Living Resources

ATCPs recognised their role in the conservation and protection of Antarctic marine living resources, which were particularly vulnerable to over-fishing and ecosystem pressures. One of the major challenges relating to the conservation of marine living resources was the lack of information regarding the marine ecosystem. This was acknowledged at early ATCMs, where scientific research and study of the marine environment was encouraged (Recommendation VIII-10 and Recommendation IX-2). An early initiative of ATCPs was the Biological Investigation of Marine Antarctic Systems and Stocks Program, which aimed to contribute to the early development of a conservation regime (Recommendation IX-2 para. I) (Sahrhage 1985). Interim guidelines for the Conservation of Antarctic Marine Living Resources were adopted by Treaty Parties until such time as a new regime was created (Recommendation IX-2 para. II). A series of meetings saw the elaboration of the draft regime, and the text was finalised at the Conference on the Conservation of Antarctic Marine Living Resources in Canberra in 1980. The conference was attended by ATCPs and observers from invited international organisations and bodies including, *inter alia*, the IUCN, IWC, SCAR and FAO. CCAMLR was finalised and opened for signature on 20 May 1980, entering into force on 07 April 1982.

CCAMLR has a single, simple objective: "the conservation of Antarctic marine living resources" (Article II.1). The concept of conservation for CCAMLR allows for rational use (Article II.2). The Convention applies to all finfish, molluscs, crustaceans and other marine living organisms (including birds) (Article I.2) found south of the Antarctic Convergence[11] and forming part of the Antarctic marine ecosystem[12] (Article I.1) (hereafter referred to as the CCAMLR region, see Figure 4.2). CCAMLR represents one of the earliest applications of the ecosystem approach in international law. As at March 2006 CCAMLR had 32 Contracting Parties comprising 24 members of the CCAMLR Commission (Table 4.2).

[11] The Antarctic Convergence (known now as the Polar Front) was defined in Article I.4 by a series of coordinates that loosely follow the location of the Polar Front at the time CCAMLR was negotiated. The Polar Front is dynamic and accordingly has moved since CCAMLR was signed.

[12] Article I.3 defines the Antarctic marine ecosystem as "the complex of relationships of Antarctic marine living resources with each other and their physical environment".



Source: http://www.ccamlr.org/pu/e/conv/map.htm, cited December 2005

Figure 4.2 CCAMLR Convention Area and Statistical Regions

The CCAMLR Commission was established under Article VII.1. Membership is open to original signatories, acceding States and organisations (Article VII.2). The CCAMLR Commission's function is to aid in implementation of CCAMLR (Article IX.1). Duties of the Commission are described in Article IX.1 (see Box 4.1) and include conducting and encouraging data collection and research, creation of conservation measures and assessment of the effectiveness of the conservation measures (see recommendations, decisions and measures made by ATCMs and regional fisheries bodies, Article IX.4 and 5). The CCAMLR Commission maintains and circulates information to Contracting Parties regarding the adoption and implementation of conservation measures (Article IX.3), including any notifications of refusal to accept all or part of any conservation measure (Article IX.5).

Box 4.1 The CCAMLR Commission's Duties (Article IX.1)

a)	facilitate and encourage research
b)	compile data on species status and factors influencing their ecology (for both harvested and dependent or associated species)
c)	ensure collection of catch and effort statistics for harvested species
d)	analyse data and report findings
e)	identify conservation needs and effectiveness of existing measures
f)	create, adopt and maintain conservation measures
g)	implement systems of inspection and observation
h)	conduct other activities as appropriate

Article IX.2 describes the conservation measures to be created by the CCAMLR Commission (see Box 4.2). The CCAMLR Commission has the power to set limits on harvest rates, to designate protected species and areas (perhaps seasonally), and to set gear or harvest method restrictions. Advice on measures may be provided by the Scientific Committee to CCAMLR (SC-CCAMLR) (established under Article XIV.1). Additionally, Contracting Parties to CCAMLR must consider relevant recommendations, decisions and measures made by ATCMs and regional fisheries bodies (Article IX.4 and 5).

The SC-CCAMLR supports the practical requirements of the CCAMLR Commission under Article IX.2, and sets the criteria by which conservation measures are created (Article IX.2(a)). The SC-CCAMLR advocates and performs research and analysis on the status and trends of marine species, encouraging cooperation and research between Contracting Parties (Article XIV.1 and 2). Importantly, the SC-CCAMLR must assess potential direct and indirect implications of harvesting and proposed conservation measures on species (Article XIV.2(c) and (d)).

Box 4.2 Conservation Measures (Article IX.2)

Conservation Measures
a) designation of quantities of any species to be harvested
b) creation of regions or sub-regions based upon population distribution
c) designation of quantities of species to be harvested by region/sub-region
d) designation of protected species
e) restrictions on size, age, sex of harvested species
f) designation of open and closed seasons for harvesting
g) designation of open/closed seasons, areas, regions or sub-regions for scientific research or conservation (including special areas for protection and scientific study)
h) restrictions on effort/methods used to harvest species to avoid concentrated efforts in one region/sub-region
i) creation of other measures as appropriate

CCAMLR promotes cooperation and collaboration between all Contracting Parties, members of the CCAMLR Commission, and the SC-CCAMLR. CCAMLR adopts the position of the Antarctic Treaty regarding the freeze of territorial claims, thereby avoiding further conflict regarding sovereignty (Article IV). Members of the CCAMLR Commission should collect information, exchange data and report on activities, including their implementation of CCAMLR's measures (Article XX). The CCAMLR Commission informs members of the actions of any State found to be acting in a manner contrary to CCAMLR, whether or not they are a Contracting Party. The offending State is also notified by the CCAMLR Commission when its actions affect the implementation of CCAMLR (Article X.1 and 2). Furthermore Contracting Parties must exert appropriate efforts to see that no one engages in activities contrary to CCAMLR (Article XX.2, para's 1 and 2). ATCPs must cooperate to establish a system of observation and inspection to monitor compliance with CCAMLR's measures (Article XXIV.1 and 2(a) and (b)). This system includes procedures to be followed by designated observers when conducting inspections, and procedures for flag State prosecution or sanctions (Article XXIV.2(a)).

CCAMLR addresses potential interactions with international instruments and bodies. Contracting Parties to CCAMLR retain their rights and obligations under the ICRW and CCAS (Article VI). All Contracting Parties, CCAMLR Commission members and the SC-CCAMLR are obliged to cooperate with ATCPs (Article XXIII.1), the FAO (Article XXIII.2) and other agencies including SCAR, the Scientific Committee on Oceanic Research, and the IWC (Article XXIII.3). The CCAMLR Commission must additionally consult with any Contracting Parties that have jurisdiction in marine areas adjacent to the CCAMLR region in order to ensure consistency in conservation measures for transboundary stocks (Article XI). Although the Agreed Measures are now largely

superseded by the Madrid Protocol, CCAMLR addressed the application of the Agreed Measures within the Treaty area, and asserted that Contracting Parties to CCAMLR must not act in a manner contrary to the Antarctic Treaty (Article III), and must also observe the Agreed Measures and other recommended measures of the ATCPs (Article V.2). These measures apply to both Treaty Parties and non-Treaty Parties that are Contracting Parties to CCAMLR. Since CCAMLR was developed after the Antarctic Treaty and Agreed Measures, CCAMLR's mandate must not derogate from the rights and obligations of those States under those, or other international treaties. LOSC is not mentioned within the text of CCAMLR since it was signed in 1982, two years after CCAMLR was open for signature.

Parties subject to a dispute are encouraged to resolve it themselves, otherwise to take the matter to the International Court of Justice (Article XXV). The text of CCAMLR may be amended at any time, but may be subject to discussion at the request of one third of CCAMLR Commission members. For the amendment to enter into force all Commission members must lodge their instrument of ratification, acceptance or approval (Article XXX).

4.5.1 Status, Evolution and Analysis

CCAMLR had implemented 303 conservation measures since the Convention was adopted in 1980 through to the 2004/05 season. Of these, 66 were still in force for the 2004/05 season. The conservation measures are an integral part of the operation of CCAMLR and outline specific obligations that Contracting Parties must implement in order to comply with CCAMLR. The CCAMLR Commission manages fisheries activities within regions or subregions which can be designated for various purposes from no-use (strictly protected areas, areas for scientific research and monitoring), through to areas managed for rational use. These could be viewed as a protected area of sorts, although the Commission also provides for the protection of key areas for scientific monitoring and research of impacts as part of the CEMP. CEMP was developed in 1986 in order to assist in the detection of significant ecosystem changes primarily by monitoring key predators of krill, measuring fisheries versus natural impacts and environmental interactions (Constable 2001, Croxall and Nicol 2004). CEMP sites form part of the Antarctic PAS, and as at March 2006 there were only two CEMP areas designated.

Amongst the most significant measures are those that address IUU fishing. Any fisheries not complying with CCAMLR in the region are considered to be IUU fisheries and threaten to undermine its successful operation (Constable et al. 2000). IUU fishing is also known to impact non-target species as fisheries by-catch. Two significant developments in how CCAMLR addresses IUU fishing include the VMS (Conservation Measure 10-04 (2004)) and the CDS (Conservation Measure 10-05 (2004)). The VMS measure applies to all fisheries except those targeting krill, and obligates Contracting Parties to ensure that their flag vessels are equipped with compliant and tamper proof satellite-linked continuous vessel monitoring. The VMS should report on the vessel's location, time, date, speed and course, and meet numerous operational and reporting requirements. The CDS applies to *Dissostichus* species (toothfish) and calls upon Contracting Parties to identify the origin of toothfish species imported into or exported from its territories and to ensure that any such harvesting was undertaken consistent with the CCAMLR conservation measures. Parties have a duty to ensure authorised flag vessels have completed a toothfish catch document and only authorise landings of vessels in possession of this document. Importantly, this applies to any flag vessels with the intention of harvesting toothfish species, whether within or outside the CCAMLR region (on the high seas). Non-Contracting Parties may also cooperate with CCAMLR to issue toothfish catch documents to flag vessels so as to ensure that any landings of toothfish species comply with CCAMLR measures.

Under Conservation Measure 10-07 (2003) Contracting Parties should promote compliance by non-Contracting Party vessels with the CCAMLR conservation measures. Contracting Parties are encouraged to report vessels engaging in IUU fishing, prevent landing or transhipment of any fish species subject to CCAMLR conservation measures unless that State can prove compliance with CCAMLR measures, consistent with Conservation Measure 10-03. If a Contracting Party to CCAMLR sights any vessels undertaking fishing activities and suspected to be acting in contravention to CCAMLR conservation measures they must inform that vessel that they are believed to be undermining the effectiveness of the CCAMLR conservation measures and that they will be reported for doing so. Despite this, third-Party States cannot necessarily be prosecuted under international law for breaching the CCAMLR Commission's conservation measures since they have not signed CCAMLR nor signalled their intention to adhere to the CCAMLR Commission's measures. No conservation

measures have been implemented to address possible interactions of CCAMLR with LOSC. This could potentially be a problem area for CCAMLR in the future since high seas (of which the CCAMLR region comprises) are considered qualified open-access areas under LOSC. Already third-Party States engage in fishing the CCAMLR region and maintain that it is within their rights under LOSC.

The CCAMLR Commission has a key role in tracking and reporting non-compliance with conservation measures by both Contracting and third-Party States. In recent years, for example, the CCAMLR Commission has kept a list of vessels involved in IUU fishing and reports on Contracting Parties that are seen to be undermining the effectiveness of CCAMLR, for example vessels not complying with conservation measures such as the VMS or CDS (Conservation Measure 10-06 (2004)). The CCAMLR Commission works closely with ATCPs to promote and encourage compliance with CCAMLR conservation measures. IUU fishing represents a major threat to the effective operation of CCAMLR, and in 1999 Contracting Parties to the Antarctic Treaty were asked to support the CCAMLR Commission's efforts to address IUU fishing (Resolution 3(1999)). This resolution asked that Treaty Parties adopt the CDS and consider other measures that might help them meet their obligations under CCAMLR. IUU fishing was again addressed at SATCM XII-Resolution 2(2000) when Antarctic Treaty Parties who are not Contracting Parties to CCAMLR were asked to participate in, or voluntarily comply with, CCAMLR's CDS, particularly those whose vessels fish for, or are involved in the trade of, toothfish. CCAMLR has also had concerns about reflagging, or States not effectively controlling their vessels in the CCAMLR region whereby non-Contracting Parties are known to have reflagged their vessels as a means of avoiding compliance with international conservation and management measures. Resolution 19/XXI addressed this issue and requested that Parties do not support or allow vessels under their jurisdiction to engage in IUU fishing (including taking measures to prevent transfers and landings of catch from vessels under flags of convenience) (Kimball 2001).

The CCAMLR Commission has created and revised many other conservation measures pertaining to gear specifications, new and exploratory fisheries, by-catch mitigation measures (seabirds and marine mammals, which are dependent and associated species) and catch and effort reporting systems (CCAMLR Commission 2004) (Resolution

xx/XIII). Furthermore, some conservation measures call on Contracting Parties to cease fishing activities when by-catch limits are exceeded (e.g. Conservation Measure 33-02 (2004) Limitation of by-catch in Statistical Division 58.5.2 in the 2004/05 season). CCAMLR addresses States or vessels operating in areas adjacent to the CCAMLR Region, stating that they should harvest stocks adjacent to the area "with due respect for the conservation measures it has adopted under the Convention" (Resolution 10/XII). Although CCAMLR Commission members are not currently engaged in large scale pelagic driftnet fishing, CCAMLR sanctioned the UNGA Resolution 44/225 in prohibiting these activities in the CCAMLR Region (Resolution 7/IX).

CCAMLR has been criticised for not addressing seals and whales in their text. Instead, CCAMLR defers to CCAS and the IWC regarding these matters. With both CCAS and the ICRW in place prior to the development of CCAMLR, there is some justification for CCAMLR not applying to these species (particularly since the instruments could overlap and/or conflict). However since whales and seals are major top predators and key components of the Antarctic ecosystem, this could be considered a flaw in the regime. Crabeater and fur seals are, however, CEMP indicator species, which means that their status is monitored and considered in CCAMLR's implementation of the ecosystem approach. On the issue of whales, at CCAMLR XXIV (2005) an NGO signalled an intention to discuss whales in the CCAMLR Commission meeting, which would have been entirely consistent with the Convention's ecosystem approach[13], but the suggestion was not well received by CCAMLR Commission members because of the highly political and emotional sensitivity of the matter. The NGO was advised not to initiate the discussion inside the meeting room (Jabour 2006b). Despite this, the SC-CCAMLR have recommended that a joint CCAMLR-IWC workshop should be held to consider how to better incorporate information on top predators into their ecosystem monitoring program (Scientific Committee-CCAMLR 2005). Hoyt (2005) recommended that CCAMLR, the IWC (and particularly the Southern Ocean Whale Sanctuary) and the ATS should work together in ensuring adequate protection of whales and their critical habitat, complemented by a system of MPAs.

[13] In fact, minke whales were at one time (in the mid-1980s) a CCAMLR indicator species, but even then discussion was too political and, despite their key role in the ecosystem, they disappeared from the CCAMLR Commission meeting agenda (CCAMLR Commission 1992).

The SC-CCAMLR has acknowledged the need to participate in international discussions on the development and implementation of global MPA networks (Scientific Committee-CCAMLR 2004, para. 3.28). SCAR (via their Life Sciences Standing Scientific Group-LSSSG) has also been involved in discussions on MPAs with CCAMLR (SC-CCAMLR 2004, para. 3.40). These discussions culminated in a MPA Workshop in 2005.

CCAMLR MPA Workshop

The CCAMLR Commission held a workshop on MPAs from 29 August 2005 to 01 September 2005, acknowledging the need to work both within and beyond the ATS and to ensure that any proposed MPAs were consistent with Articles II and IX of the Convention. At the Workshop, attendees discussed the current state of knowledge regarding MPAs, how MPAs could further CCAMLR's objectives, current proposals under consideration within the CCAMLR region, and the scientific information required for the development of MPAs to further the objectives of CCAMLR (including identifying biophysical regions) (CCAMLR Commission 2005a). The Workshop recognised the benefits of collaboration both within and beyond the ATS (e.g. through organisations such as SCAR but also other intergovernmental organisations and NGOs), also highlighting the fact that many CCAMLR Parties are also Parties to other international instruments concerned with high seas MPAs (CCAMLR Commission 2005a, para. 17).

The costs of selection, designation, management and enforcement were raised, but the Workshop reiterated the improvements in these areas under CCAMLR and also highlighted the possibility of funding through the World Bank and Global Environment Facility (CCAMLR Commission 2005a, para's 18-20). Representative areas, scientific reference areas (i.e. those inviolate of human activities) and areas vulnerable to human impacts were highlighted as requiring attention and possible protection (CCAMLR Commission 2005a, para. 62). However, any system of protected areas established by the CCAMLR Commission must have due consideration for the objective of rational use under CCAMLR (CCAMLR Commission 2005a, para. 64). Candidate MPAs may not have sufficient information to inform the decision-making process, and as such the Workshop agreed that interim protection may be needed to implement CCAMLR's precautionary approach (CCAMLR Commission 2005a, para. 68). To differentiate areas

set aside for conservation purposes, and those set aside for fisheries purposes, the Workshop referred to 'Conservation Zones' and 'Fisheries Closed Areas'.

At the MPAs Workshop participants considered proposals that relate to the CCAMLR Convention Area including the Prince Edward Islands area, the Anvers Islands area and the Balleny Islands area. The Workshop concluded that in order to develop an MPA network, more scientific information was required, specifically the development of a broad-scale bioregionalisation of the Southern Ocean, a fine-scale subdivision of those bioregions, and identification of potential MPAs (including representative and scientific reference areas) including those requiring interim protection (CCAMLR Commission 2005a, para. 107). Importantly, the Workshop acknowledged that protected areas may proceed prior to the full bioregionalisation being completed (CCAMLR Commission 2005a, para. 108). Work has already commenced on collating the required information for bioregionalisation, and collaborating regarding the approach to be used for developing the regions, including the establishment of a Steering Committee to coordinate these efforts (CCAMLR Commission 2005a, para. 114). Furthermore, any Party or organisation proposing an Antarctic Specially Protected Area (ASPA) or Antarctic Specially Managed Area (ASMA) with a significant marine component must gain the CCAMLR Commission approval (see section 4.6.1).

CCAMLR's pre-emptive approach to conservation was very progressive at the time of its adoption and is often cited as one of the first global examples of the ecosystem approach (Brown and Manheim 1985, Hofman 1985, Wells 1998, Anon 2003). CCAMLR was developed prior to the commencement of heavy commercial exploitation. The CCAMLR definition of conservation also includes rational use of marine living resources and applies the concept of maximum sustainable yield. Contracting Parties to CCAMLR must ensure that harvesting activities do not exceed set thresholds or cause changes to the marine ecosystem that cannot be reversed within two to three decades. CCAMLR applies the ecosystem approach not only because the boundary within which CCAMLR measures apply is based on ecological (not arbitrary or political) boundaries, as defined by Antarctic Polar Front (otherwise known as the Antarctic Convergence, see Article 1.4), but also because it considers dependent and associated species in its protective measures. Furthermore, CCAMLR advocates the precautionary approach to management. CCAMLR is unique in its governance: it

applies to the subantarctic (where State jurisdiction applies), the Antarctic (where in some cases the Antarctic Treaty applies), and in international waters.

Implementation of CCAMLR, incorporating the ecosystem and precautionary approach, is only now coming to full realisation, and is subject to adaptive management via CCAMLR's conservation measures. However, CCAMLR was developed in the 1980s, when marine living resources weren't the only item on the agenda with respect to Antarctic resource exploitation. The potential exploitation of other Antarctic resources was also under discussion, leading to the development and adoption of the Madrid Protocol.

4.6 The 1991 Protocol on Environmental Protection to the Antarctic Treaty

The exploration and exploitation of Antarctic minerals was being hotly debated by the international community in the 1980s, and the ambiguity of territorial sovereignty in the Antarctic was again exposed. ATCPs developed the text for CRAMRA in response to growing concern regarding mineral exploration and exploitation in the Antarctic. At the last minute, both Australia and France refused to sign CRAMRA, which consequently was never opened for ratification. The outcome was the urgent development of a replacement text: the Madrid Protocol. Negotiations for the Madrid Protocol were undertaken at the Eleventh Antarctic Treaty Special Consultative Meeting (SATCM XI) and a series of meetings in Madrid in 1991 (SATCM XI, para's 1 to 5)[14]. At the conclusion of the Madrid meeting, the Madrid Protocol text (including Annexes I to IV) was open for signature by any State that was a Contracting Party to the Treaty. The Madrid Protocol was adopted and signed by consensus on 04 October 1991. Annex V[15] was negotiated separately due to time pressures, and adopted under Recommendation XVI-10. Annexes I to IV entered into force on 14 January 1998, whilst Annex V entered into force on 24 May 2002. Annex VI was adopted by consensus at ATCM XXVIII in 2005 (Measure 1(2005)), and has not yet entered into force. An interim measures is in place until the Annex is fully operational. The text of the Madrid Protocol

[14] All ATCPs were invited to attend, as well as the ASOC, the Commission of the European Communities; the CCAMLR Commission; the IUCN; the Intergovernmental Oceanographic Commission; SCAR; and the World Meteorological Organisation.

[15] Annex V of the Madrid Protocol superseded the Agreed Measures which had until this time been voluntarily adopted by ATCPs as interim guidelines (Recommendations III-9, IV-1 to 15, IV-20,VIII-4, and X-5).

incorporated some of the provisions of CRAMRA, whilst formalising many hortatory Recommendations of earlier ATCMs (US Department of State 2002). As at March 2006 there were 32 signatories to the Madrid Protocol as described in Table 4.2 (http://www.cep.aq, cited March 2006).

The Madrid Protocol applies to all authorised human activities within the Treaty Area[16] (Article 3.4), which was designated under the Madrid Protocol as a "natural reserve, devoted to peace and science" (Article 2). The Madrid Protocol aims to facilitated comprehensive protection of the Antarctic, including dependent and associated ecosystems in its mandate (Article 2 and Article 3.1). The environmental principles described in Article 3 acknowledge the need to protect the intrinsic, wilderness and aesthetic values of the Antarctic. Article 3.1 further emphasises the role of scientific research within the Antarctic in contributing to the understanding of both the global environment and the Antarctic (Article 3.1 and 3.3).

ATCPs must limit adverse impacts on the Antarctic environment[17] and plan their activities, including contingency planning for accidents that may have an environmental impact, and the adoption of set safety and technical procedures. Furthermore, ATCPs must exercise judgements and monitor the environment and/or ecosystem to allow for early detection of possible impacts (Article 3.2). Article 8 requires Contracting Parties to apply the procedures set out in Annex I for EIA, which applies to scientific, tourist, governmental and non-governmental programmes (Article 8.2). Mineral resources activity is prohibited under Article 7 and Article 25.5. In the event that a legally binding Antarctic minerals regime enters into force, this ban is excepted, providing the regime stipulates the circumstances in which minerals resources activities would be acceptable in the Antarctic (Article 25.5).

[16] These are the activities for which advanced notice is required under Article IX of the Antarctic Treaty, with the exception of CCAMLR-related activities. CCAMLR activities are exempt from having to complete an EIA (Herr RA (2000) CCAMLR and the Environmental Protocol: relationships and interactions. In: Vidas D (ed) Implementing the Environmental Protection Regime for the Antarctic. Kluwer Academic Publishers, London, UK., p 273-284).

[17] Parties should avoid activities that might have adverse impacts on: climate/weather; air or water quality; atmospheric, terrestrial, glacial or marine environments; species or population distribution, abundance or productivity; endangered or threatened species; or that might degrade/put at risk areas of biological, scientific, historic, aesthetic or wilderness significance (Article 3.2(b)).

Contracting Parties to the Madrid Protocol enact their obligations by various means including laws, regulations and guidelines to ensure compliance by their nationals (Article 13). ATCMs are the forum in which measures and policies for the implementation of comprehensive environment protection for the Antarctic are defined, using the best scientific and technical advice available (Article 10.1(a) and (b)). The Committee for Environmental Protection (CEP)[18] was established under Article 11.1 to provide advice and formulate recommendations to ATCMs, as outlined in Box 4.3.

Box 4.3 Functions of the CEP (Article 12.1):

The CEP shall provide advice on:
a. The effectiveness of the Madrid Protocol and its measures
b. The need for updates/improvements to these measures
c. The need for additional measures or Annexes
d. The preparation and implementation of EIAs
e. The means by which to prevent or minimise negative impacts of activities
f. Urgent response procedures (see also Article 15)
g. The operation and elaboration of the Antarctic PAS
h. Inspection procedures and reporting
i. The collection, archiving and exchange of information

Cooperation and collaboration is encouraged amongst ATCPs to ensure that all instruments of the ATS operate in harmony and are applied consistently (Article 5). Article 6 encourages joint research programmes, cooperation in EIA preparation, information exchange and promotes joint expeditions and shared station facilities (Article 6). Article 6.3 addresses the need to cooperate with States with jurisdiction in areas adjacent to the Treaty Area to avoid environment impacts on those areas. The CEP must collaborate with SCAR, the SC-CCAMLR and other relevant organisations (Article 12.2). Contracting Parties must ensure that the activities of any State do not engage is activities that undermine the measures set within Madrid Protocol, and to inform other States of any such activities (Article 13). Contracting Parties can designate observers to carry out inspections, either independently or cooperatively, to ensure compliance with the Madrid Protocol (Article 14). Observers must follow set procedures and report on the outcomes of any inspections conducted (Article 14). A final item that the Madrid Protocol addressed was the question of liability for damage arising from activities occurring within the Treaty Area. ATCPs committed to the creation of an additional Annex that elaborates on rules and procedures dealing with

[18] Membership of the CEP is open to Contracting Parties to the Madrid Protocol. Observer status is granted to all ATCPs, SCAR and the Scientific Committee for CCAMLR, or by invitation (Article 11).

liability (Article 16). Following nearly 14 years of negotiation, text was finally agreed upon by the ATCPs at their 2005 ATCM and now forms Annex VI (Measure 1(2005)).

The Madrid Protocol supplements the Treaty (Article 4), increasing the obligations of ATCPs under the ATS. The Annexes form an integral part of the Madrid Protocol, with each Annex addressing a different component of the Antarctic Environment[19]:

- Annex I - Environmental Impact Assessment
- Annex II - Conservation of Antarctic Fauna and Flora
- Annex III - Waste Disposal
- Annex VI - Prevention of Marine Pollution
- Annex V - Area Protection and Management
- Annex VI - Liability Arising from Environmental Emergencies

Annex I – Environmental Impact Assessment

Annex I requires that all those conducting activities in the Antarctic must undertake a preliminary assessment of their activities (Article 1.1). This assessment must be completed prior to commencement of the activity. If the potential impact is judged to be minor or transitory, the activity may proceed as planned (Article 1.1). Otherwise an Initial Environmental Evaluation (IEE) or a Comprehensive Environmental Evaluation (CEE) must be prepared (the CEP has devised Guidelines for Environmental Impact Assessment in Antarctica (http://www.cep.aq/default.asp?casid=5073, cited December 2005). The IEE should provide information on the proposed activity, including the reason, location, duration and intensity of the activity (Article 2.1(a)). IEEs should also outline alternative approaches and possible impacts of the activity, and should incorporate methods to enable an assessment of impacts (Article 2.1(b)). If the activity is assessed as having no more than a minor or transitory impact, it can proceed, otherwise a CEE is required (Article 3.1)[20]. Article 3.2 describes the detail required within a CEE, which includes:

- all information required for an IEE (Articles 3.2(a) and (b))
- methodologies used to estimate impacts (Article 3.2(c))
- possible direct, indirect and cumulative impacts (Articles 3.2(d) and (e) and (f))

[19] The only cases in which the Annexes do not apply is in the event of an emergency relating to the safety of human life, ships, aircraft, equipment and facilities of high value, or to the protection of the environment.

[20] A CEE may also be prepared in accordance with Article 3 of the Madrid Protocol, hence may circumvent the preliminary and/or IEE stage (Annex I, Article 2.1).

- possible measures that could minimise or mitigate impacts and respond to accidents (Article 3.2(g))
- the identification of unavoidable impacts (Article 3.2(h))
- impacts on scientific research and existing values or uses (Article 3.2(i))
- acknowledgement of uncertainties or gaps in knowledge (Article 3.2(j))
- a non-technical summary (Article 3.2(k))
- contact details of the person and organisation that prepared the CEE (Article 3.2(l)

The draft CEE must be circulated to the public, Contracting Parties and the CEP (Article 3), who provide advice and feedback to be addressed in the final CEE (Article 3.6). The activity may not proceed until the ATCM reviews the advice of the CEP[21], who recommends whether the activity may proceed based upon the final CEE and other relevant considerations (Article 4). If the CEE is approved and the activity is allowed to proceed, various procedures must be established. These include the monitoring and recording of impacts, provision of information on measures to minimise and mitigate impacts, and whether there is a need to suspend, cancel or modify the activity (Article 5.2). Notwithstanding, neither the CEP nor the ATCM can veto any activity should the proponent Party wish it to proceed.

Annex II – Conservation of Antarctic Fauna and Flora

Annex II of the Madrid Protocol draws largely from the text of the 1964 Agreed Measures. Article 1 outlines definitions to assist in the application of the Annex. The taking or harmful interference[22] with native fauna and flora is prohibited unless authorised by a permit (Article 3.1), which may only be issued for collection of specimens (Article 3.2(a) and (b)). New permit conditions stipulate that the taking of species be kept to a minimum level able to meet the objectives for which the permit was

[21] Provided that the review is not delayed by more than 15 months from the circulation of the draft CEE (Article 3.5).

[22] Taking is defined as "to kill, injure, capture, handle or molest, a native mammal or bird, or to remove or damage…native plants" in quantities that significantly affect local distribution and abundance (Article 1(g)). Harmful interference includes vehicular or aircraft disturbances to bird or seal concentrations (Article 1(h)(i) and (ii)), usage of explosives or firearms that results in disturbances of birds or seals (Article 1(h)(iii)), wilful disturbance on foot to breeding or moulting birds (Article 1(h)(iv)), causing significant damage to native terrestrial plants by vehicular, air or foot traffic (Article 1(h)(v)), or any activity that results in significant modification of "habitats of any species or population of native mammal, bird, plant or invertebrate' (Article 1(h)(vi)).

issued. Any scientific take should not exceed the level normally replaced by natural reproduction in the subsequent season, and should allow for the maintenance of species diversity and ecological balance within the Treaty Area (Article 3.3). SPSs are afforded special protection under Article 3.4. SPS can only be taken for compelling scientific purposes providing their use will not risk their survival or recovery (Article 3.5(a) and (b)). When taking SPS, Article 3.5 stipulates the use of non-lethal techniques as appropriate, and Article 3-6 requires Contracting Parties to use the least degree of pain and suffering practicable. Appendix A lists SPS, which currently includes fur seals and Ross seals. Article 4 addresses introduced species, parasites and diseases. Permits are required to bring any non-native animal or plant into the Antarctic (Article 4.1), and only animals or plants listed in Appendix B are permitted if kept under strict supervision and containment (Articles 4.3 and 4.5). Article 4 does not apply to food imports (although live animals imported for food must be strictly confined). Appendix C outlines precautions to be followed to avoid introduction of micro-organisms to native fauna and flora (Article 4.6)[23].

Contracting Parties must collect and exchange information regarding species taken and permits granted each year (Article 6.1(a) and 6.2). They must also ensure that any of their nationals visiting the Antarctic are provided with information regarding prohibited activities, SPS and Protected Areas (Article 5). Contracting Parties are required to report on the status of native Antarctic species, including advice on whether any species or population requires protection (Article 6.1). Annex II does not preclude Parties from their rights and obligations under the International Convention for the Regulation of Whaling (Article 7).

Annex III – Waste Disposal and Waste Management

The waste disposal and management annex aims to reduce waste produced and disposed of within the Treaty area to minimise impacts and protect the natural, scientific and other uses of the Antarctic (Article 1.2). Parties must plan their activities with consideration of waste storage, disposal and removal, as well as providing for recycling and waste reduction (Article 1.3). Where waste is removed from the Treaty area, it should be returned to the originating country unless alternative disposal is arranged

[23] Appendix C-1 bans the import of live poultry or other living birds, stipulates the inspection of dressed poultry for disease and outlines appropriate disposal methods for remains of poultry. Appendix C-2 stipulates that non-sterile soils should not be imported to the greatest possible extent.

(Annex III, Article 1.4). Past and present waste disposal and abandoned work sites must be cleaned under Article 1.5, unless such action will cause removal of historic sites or monuments (HSMs), or greater detrimental environmental impacts than leaving the waste undisturbed. Waste management planning is a requirement under Article 8.2. A waste classification system was introduced under Article 8.1 for impact assessment and reporting by designated waste management officials (Article 8.1, 9.1 and 10). Parties must prepare annual reports pertaining to their waste management practices (Article 9), and circulate inventories, including information on past activities (Article 8.3).

Article 2 outlines materials that should be incinerated, sterilised or removed from the Treaty area by the generator of the wastes. Procedures for waste incineration are described in Article 3, which also phased out open burning techniques. Disposal of waste is not permitted in ice-free areas or freshwater systems, but may otherwise occur on land within the constraints of Article 4. Article 4.1 prevents the disposal of sewage and liquid wastes on the sea-ice, ice shelves or the ice-sheet. Instead this waste should be disposed of in deep ice pits or removed to supporting stations or ships where practicable (Article 4.2 and 4.3). Waste items for removal or disposal elsewhere must be contained in storage that avoids any dispersal into the environment (Article 6). Article 5 specifies that sewage and domestic liquid waste may be disposed of directly into the sea provided it can be rapidly diluted and dispersed, that large quantities have been macerated and that the local environment will not be adversely affected (Article 5.1(a) and (b) and 5.2). A number of items are prohibited within the Treaty area including, *inter alia*, certain packaging (e.g. polystyrene), non-sterile soils and polychlorinated biphenyls (Article 7).

Annex IV - Prevention of Marine Pollution

Annex IV applies to all ships operating within the Treaty area (Article 2), but does not derogate from the rights and obligations of Parties under MARPOL 73/78 (Article 14). Article 9.1 requires that Parties must ensure that ships flying their flag or supporting their operations can adequately handle and store all wastes. Parties are encouraged to consider the requirements of Annex IV in the design, construction, manning and equipment of ships under Article 10, and to plan for the reception and disposal of waste products at ports *en route* to or from the Treaty area (Article 9).

Oil, oily discharges, residues and mixtures may not be discharged into the sea within the Treaty area unless otherwise allowed under Annex I of MARPOL 73/78 (Article 3.1). Disposal of noxious liquids into the sea in harmful quantities or concentrations is prohibited (Article 4), as is disposal of plastics or other garbage (Article 5.1 and 5.2). Restrictions also apply to disposal of certain wastes within 12 nautical miles of land or ice shelves, including ground food wastes (Article 5.3) and untreated sewage (Article 6.1(b)). Contracting Parties are instructed to consider and avoid detrimental impacts on dependent and associated ecosystems outside the Treaty area (Article 8). Disposal of garbage and sewage must be logged in garbage or sewage record books as appropriate (Article 5.6 & Article 6.2). Contracting Parties must cooperate to formulate contingency plans and emergency response procedures incorporating the advice of the CEP, IMO and other international organisations (Articles 12.1 and 12.2). In the event of emergencies Annex IV does not apply providing reasonable precautionary and reactionary measures are taken (Articles 3.2 and 5.5).

Annex V – Area Protection and Management

Annex V of the Madrid Protocol provides for additional protection of areas of special conservation value in the Antarctic as either ASPAs or ASMAs[24]. Essentially ASPAs are primarily designate to protect and preserve an area's value, where-as ASMAs are to facilitate area management and/or multiple-use. Annex V served to simplify the Antarctic PAS, remove confusion regarding the area classifications and provide a clearer framework for designation and selection of sites (Lewis Smith et al. 1994).

Within ASPAs and ASMAs activities are prohibited, restricted or managed in accordance with Management Plans adopted under Article 5. A third type of classification was also outlined in Article 8 to allow for the protection of areas with historical values (HSMs)[25]. A HSM may overlap or be contained within an ASPA or ASMA. Any site not already identified as an ASPA or ASMA, but identified as having recognised historic value, may be proposed by any Contracting Party for listing as a HSM (Article 8.2). HSMs may not to be damaged, removed or destroyed (Article 8.4). Cooperation and information exchange on protected areas is encouraged under Articles

[24] Protected areas can be proposed by any Party, the CEP, SCAR or the CCAMLR Commission by submission of a management plan to the ATCM (Article 5.1).

[25] Sites formerly designated as Historic Monuments at ATCMs are included in the HSM listing under Annex V (Article 8.3).

9 and 10. Annual reporting should include information on protected area status and maintenance, permits issued, site visits and inspection reports and the implementation of Annex V (Article 10).

ASPAs are designated to protect any area for its "outstanding environmental, scientific, historic, aesthetic or wilderness values" (Article 3.1). The ASPA classification subsumes SPAs and SSSIs formerly designated under the Agreed Measures (Article 3.3). At ATCM XX a revised renumbering of Antarctic protected areas was adopted in Resolution 5(1996). Each respective SPA or SSSI would adopt the ASPA renumbering once a revised management plan in Annex V format had been accepted by the ATCPs. Entry into an ASPA is prohibited except via permit (Article 3.4), which may be issued for compelling scientific research unable to be served elsewhere and providing the ecological system integrity is maintained. Permits must meet the requirements of the management plan, and include details on approved activities, locations and timing, the person/s authorised to conduct those activities and any other conditions (Article 7.1). Article 3.2 calls on Contracting Parties to identify ASPAs within a "systematic environmental-geographical framework"[26] that includes areas:

a) kept inviolate from human activities
b) that are representative examples of key terrestrial and marine ecosystems
c) with important or unusual assemblages of species
d) of the type locality or only known habitat of species
e) of particular interest for scientific research
f) with exceptional geological, glaciological or geomorphological features
g) of outstanding aesthetic or wilderness value
h) sites/monuments of historic value
i) that otherwise meet the criteria outlined in Article 3.1

[26] The systematic environmental-geographic framework has never been fully defined and has been the subject of some debate at ATCMs over the past decade. For example, see ATCM XXV / WP13 (2002) Report back on a Systematic Environmental-Geographic Framework (SEGF) for Protected Areas under Annex V of the Environmental Protocol. ATCM XXV / Working Paper (WP13), submitted by New Zealand, ATCM XXVI / IP01 (2003) Environmental Domains for the Ross Sea Region: The creation of a systematic environmental geographic framework for the Ross Sea region using Environmental Domains Analysis. ATCM XXVI / Information Paper (IP01), submitted by New Zealand. Report prepared by Landcare Research (Contract Report LC0203/089), ATCM XXVIII / WP2 (2005) Systematic Environmental Protection in Antarctica: A draft Systematic Environmental-Geographic Framework for Antarctica created using Environmental Domains Analysis. ATCM XXVII / Working Paper (WP02), submitted by New Zealand.

ASMAs can be designated in areas where planned or ongoing activities are being undertaken that have the potential of mutual interference or risk, or for sites of recognised historic value (Article 3.1 and 3.2). ASMAs are designed to assist Parties in planning and coordinating activities, thus avoiding conflicts, enhancing cooperation hence minimising environmental impacts (Article 4.1). Entry to an ASMA is not restricted, unless the ASMA contains one or more ASPAs for which a permit is required (Article 3.3 and 3.4).

When proposing the designation of ASPAs or ASMAs a management plan must be submitted for approval by the ATCM (Article 5.1). Parties are encouraged to adopt the management plan format outlined in Article 5.3 (see Box 4.4). Management Plans are reviewed by the CEP and SCAR prior to being considered at the ATCM (Article 6.1). When proposed sites have a significant marine component the management plan is also reviewed by the CCAMLR Commission (Article 6.2). The CEP considers feedback from SCAR and the CCAMLR Commission and makes a recommendation to the ATCM, at which time the proposal may be approved by the adoption of a measure at the ATCM (Article 6.1). Once approved, ASPAs or ASMAs are designated for an indefinite period unless otherwise specified, although management plans must be reviewed every five years (Article 6.3). Protected Areas designated under Annex V must be of sufficient size to protect its values (Article 5.2). This is a significant departure from the Agreed Measures, which required that protected areas be of minimum size to achieve their objectives.

Annex VI – Liability Arising from Environmental Emergencies

When the Madrid Protocol was adopted in 1991, the issue of liability was contentious and remained unresolved. Parties decided that it should be subject to separate negotiations and implemented via an additional annex to the Madrid Protocol. The issue of liability is critical for the region given the harsh conditions and high associated costs of operation and remediation in the Antarctic. Nearly 15 years after the adoption of the Madrid Protocol by ATCPs in 1991, Annex VI to the Madrid Protocol on Liability Arising from Environmental Emergencies was adopted by consensus of ATCPs at ATCM XXVIII (Measure 1(2005)). It becomes effective immediately upon approval by all ATCPs (Measure 1 (2005), para. ii).

Box 4.4 Proposed Management Plan format under Annex V, Article 5.3

Summary of inclusions

a. the value/s requiring protection
b. the aims and objectives of the management plan
c. the activities to be applied to meet those objectives
d. the period of designation
e. a geographical description of the site including coordinates, access points/routes, features and nearby protected areas
f. any zones and associated prohibitions, restrictions or procedures for activities within those zones necessary to meet the site objectives
g. maps and photographs illustrating site boundary, context and features
h. supporting documentation
i. for ASPAs, a detailed description of permit conditions including (i) access to and movement on-site, (ii) permitted activities and restrictions on time and place, (iii) installation, modification or removal of structures, (iv) location of field camps, (v) restricted materials/organisms, (vi) taking/harmful interference with native flora and fauna, (vii) collection or removal of anything from site, (viii) waste disposal, (ix) possible measures necessary to meet site aims and objectives, and (x) reporting requirements.
j. for ASMAs, a detailed code of conduct covering similar details as required for ASPAs under Article 5.3(i), but excluding restrictions on materials/organisms and the measures to be taken to meet site aims and objectives.
k. the process by which Parties should exchange information regarding proposed activities on-site.

Annex VI applies to any scientific, tourist, government and non-government activities taking place in the Antarctic (Article 1). Parties must ensure that their operators have reasonable preventative measures in place to reduce the risk of environmental emergencies and associated adverse impacts (Article 3.1), including appropriate structures and equipment, procedures and training (Article 3.2). All operators must prepare contingency plans (Article 4.1) which should include assessment and notification procedures, resource identification and mobilisation, response plans, training, record keeping and demobilisation (Article 4.2). Response procedures require immediate notification and cooperation in the event of environmental emergencies (Article 4.3).

Article 5 outlines the measures that Contracting Parties must implement for Response Action. Liability of Parties in the event of an environmental emergency is outlined in Article 6. If a Party fails to act promptly, they are liable to pay for the response action taken by other Parties on their behalf (Article 6.1), and if the State operator does not adopt a response action in an event where it was warranted, they must pay for the costs of the response action into the fund described in Article 12 (Article 6.2). In the event of an environmental emergency where more than one Party is involved, then joint responsibility applies (Article 6.4). Article 7 describes the processes for Parties to take action in the event of an environmental emergency with respect to liability. Exemptions may apply in certain circumstances such as an act necessary to save human life, an act

resulting from an unforeseen natural disaster, an act of terrorism or belligerency against the actions of the operator. Financial limits for liability are outlined in Article 9, and Parties must ensure that operators have sufficient insurance or funds to cover these costs (Article 11). A fund is set up in Article 12 for reimbursement of costs pursuant to Article 5.2. The finalisation of the text for Annex VI on liability marks substantial progress in the ATS in addressing the responsibility that States have regarding environmental impacts in the Antarctic. Decision 1(2005) calls upon Parties to approve Annex VI swiftly and to continue developing rules and procedures as necessary to address liability for damage arising from activities in the region.

4.6.1 Status, Evolution and Analysis

The Madrid Protocol is a fundamental part of the ATS as it contains numerous obligations for the protection of the Antarctic environment, both marine and terrestrial and it embraces the precautionary approach. The Madrid Protocol is a good example of how political will can produce expedient results when a perceived urgent threat to the environment is present, as it was rapidly developed and signed following the refusal of Australia and France to sign CRAMRA, which precluded it from ever entering into force. Environmental protection under the Madrid Protocol continues to strengthen. Key developments of the Madrid Protocol relating to marine conservation include the review of Annex II on the conservation of Antarctic flora and fauna, and the progression of measures for area protection under Annex V. The most recent development was the inclusion of Annex VI on liability, which is yet to enter into force. The following section describes some of the key developments in the Madrid Protocol.

EIAs (Annex I) are required for any planned Antarctic activities (although CCAMLR activities are excluded). The ATCM takes the advice of the CEP regarding whether any activity deemed to have a minor (or more than minor) or transitory impact should be allowed to proceed and under what conditions. Notwithstanding, neither the CEP nor the ATCM can actually veto any activity if the environmental evaluation process has been complied with. The only recourse the Treaty Parties have is to apply diplomatic pressure or (more likely) offer assistance to another Party whose environmental evaluation has returned a result considered unacceptable (Jabour 2006b).

In 1999, at CEP II the need to review Annex II was raised (Resolution II, 1999). SCAR found in 2004 that there were inadequate guidelines for selection and designation of

SPS. SCAR recommended that a sound scientific basis for designation was required, proposing the use of IUCN Red List criteria to aid in species selection (ATCM XXVII / IP73 2004). SCAR also suggested that any species breeding or occurring in the Antarctic with a threatened (critically endangered – CE, or EN) conservation status should automatically be listed as SPS, and that any species with a VU status should be considered for listing (ATCM XXVII / IP88 2004). To this end, in 2004 SCAR undertook a review of the conservation status of Antarctic mammals and birds (ATCM XXVII / IP88 2004).

Proposals for amending the text of Annex II have been submitted but no agreement has yet been reached (ATCM XXVII / WP17 2004, ATCM XXVII / WP22 2004). In 2005, the CEP agreed to adopt guidelines for CEP consideration of proposals for new and revised designations of Antarctic SPS under Annex II of the Protocol (ATCM XXVIII, para. 85, Annex 8). The guidelines enable any Party, the CEP or SCAR to submit proposals for SPS listing for consideration at the CEP. Any such proposal must provide scientific justification for the listing and a draft action plan in set format. If the conservation status of the species has not been assessed, SCAR should undertake an assessment using current IUCN criteria, and if SCAR believes the species to be at significant risk of extinction, then the CEP should recommend SPS designation and implement the Action Plan for the species. This should be done in conjunction with the proposing Party or organisation and other relevant authorities and organisations. Species currently listed as SPS should be assessed and if necessary, an Action Plan should be produced, or if extinction risk is no longer significant SCAR should consider delisting of the target species in full appreciation of the ongoing management and risks that may result from delisting. Some States recently questioned whether the listing of fur seals requires revision (ATCM XXVIII / WP33 2005), and whether other species should be listed as SPS (ATCM XXIV / WP05 2001, ATCM XXVII / WP17 2004). ATCPs enlisted the expertise of SCAR and the IUCN to provide advice on updating the species listed as SPS under Annex II (ATCM XXVII / IP88 2004, ATCM XXVII / WP22 2004). At ATCM XXIX, based upon the recommendation of SCAR and the CEP, fur seals were delisted as SPS (Measure 4, 2006). At the same meeting, the Annex II review was the subject of further debate, with the decision that further research was required and that the review should be discussed at ATCM XXX in 2007 (ATCM XXIX, para's 43-45).

Developments in the Antarctic Protected Area System

Measures for area protection and management are outlined in Annex V. Article 2 of the Madrid Protocol designates Antarctica as "a natural reserve devoted to peace and science", which could be interpreted to mean that the entire continent is designated as a protected area under IUCN classification (Kelleher et al. 1995, Kakabadse 2000, Chape et al. 2003, Grant 2005). However, ASPAs and ASMAs form the backbone of the Antarctic PAS, (additionally HSMs) as designated under Annex V of the Madrid Protocol. ASPAs must be of sufficient size to meet the objectives of designation, and important progression in the thinking of ATCPs who, under the Agreed Measures, stated that sites should be of minimum size to achieve their objectives (Recommendation VII-2).

The Antarctic PAS has been the subject of much discussion at ATCMs. The system had developed into a complex and somewhat confusing mix of classifications, and was finally simplified within Annex V of the Madrid Protocol (Lewis Smith et al. 1994). Early stages in the development of the Antarctic PAS saw the designation of sites proceed in an *ad hoc* manner, which some commentators claim was more about establishing a national presence in the Antarctic than about conservation and adequate representation (Kriwoken and Keage 1989, Kaye et al. 2000, Walton 2000, ATCM XXVIII / WP11 2005). Also, the global environmental movement had resulted in increased pressure for the Antarctic to fall into line with other global environmental initiatives (Lewis Smith et al. 1994).

In 1992 SCAR and the IUCN convened a joint workshop on Antarctic protected areas in (Lewis Smith et al. 1994) and presented the results to ATCM XVII for consideration. The workshop reported that the current system was not representative of all major terrestrial and marine ecosystems, there was a bias towards coastal protected areas, biologically exceptional or scientifically significant sites, particularly seabird and seal breeding sites and vegetated areas. The workshop also found that "major gaps occur in according special protection to inland sites, particularly aquatic ecosystems; geological features; landforms and glaciological formations; and to marine areas" (Lewis Smith et al 1994: 5) primarily due to the lack of an adequate bio-geographical framework. The recommendations of the workshop are described in Box 4.5.

The first formal Antarctic protected areas workshop held within the context of the Treaty System was held on 23 May 1998 in Tromsø. The terms of reference for the workshop, findings and recommendations of this workshop are outlined in Table 4.3. In 1999 a second workshop was convened by ATCPs in Lima, Peru on May 22-23. This workshop elaborated on the findings and recommendations made at the Tromsø workshop. The terms of reference, findings and recommendations are described in Table 4.4 [27].

In 2005 New Zealand prepared a review of the Antarctic PAS (ATCM XXVIII/WP11 2005), finding that 62 ASPAs protect just 0.008% of the Treaty Area, or 2741km^2 (1780km^2 marine and 960km^2 terrestrial). Their findings reiterated the assertions of the 1992 SCAR/IUCN workshop regarding the biological bias of sites (birds were the most protected faunal type, followed by invertebrates, seals and maritime communities), with the majority of protected areas designated being IUCN Category Ib – areas designated for scientific research. No sites have been designated primarily for protection of intrinsic, conservation or aesthetic values. Plant communities were often protected rather than sites designated for the protection of a particular plant species, and no sites had been designated as the type locality or only known habitat of species. The paper also highlighted that MPAs were under-represented, emphasising a need for designation of large marine ecosystems within the CCAMLR zone for protection. A geographical bias still exists in the Antarctic PAS, with greater representation in coastal regions, the Antarctic peninsula and Ross Sea Region. Marie Byrd Land in western Antarctic has no protected areas. Additionally, not all management plans were updated to Annex V format and many were overdue for their five year review (ATCM XXVIII/WP11 2005). New Zealand presented several recommendations based upon their assessment of the Antarctic PAS as at 2005 (Table 4.5).

It is now over seven years since a comprehensive Antarctic protected areas workshop has been held, although the CCAMLR Commission held a MPA workshop in 2005 (see details in Section 4.5.1). New Zealand's review of the Antarctic PAS reveals that although much progress has been made in the pursuit of an improved Antarctic PAS[28]

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[27] See also papers by Kakabadse 2000, Kaye et al. 2000, Richardson 2000, Valencia 2000, Wratt 2000 on the Antarctic PAS.

[28] Workshops and papers submitted to the ATCM have cited a number of areas that require attention for Contracting Parties to fulfil their obligations under the ATS and in particular, the Madrid Protocol (Lewis

Box 4.5 Recommendations of the SCAR/IUCN Workshop on Antarctic Protected Areas (1992)

1. All ATCPs were urged to ratify the Madrid Protocol.
2. That Treaty Parties agree on the CEP Rules of Procedure and emphasise the importance of their role in the development of the Antarctic PAS.
3. Treaty Parties should encourage proposals for new PAs and HSMs to achieve adequate geographical distribution and comprehensive environmental representation of sites in the Antarctic.
4. SCAR should consider all proposals (management plans) and provide advice to the ATCM or CEP
5. Proposals should not be rejected due to insufficient information providing information is adequate to place the proposed site within the revised SCAR ecosystem classification matrix and to form the basis of a management plan.
6. SCAR should apply the revised SCAR ecosystem classification matrix as the systematic environmental-geographic framework for evaluation of proposals until such time that an improved and internationally agreed Antarctic ecosystem classification system is adopted by the ATCM.
7. SCAR and the IUCN should provide advice on scientific/technical aspects of the Antarctic PAS including distributing their handbook on the preparation of management plans, and the promotion of research.
8. That PAs be clearly defined and delineated.
9. Management plans should clearly identify values to be protected and detail practical management objectives/methods.
10. That existing SSSIs and SPAs be reclassified and management plans prepared for all renumbered sites are required.
11. ATPs should establish a standard methodology for surveillance and monitoring and develop cooperative mgt plans in areas where multiple TPs are interested or various values requiring protection occur.
12. Permits issued for entry into PA must require compliance with the management plan.
13. PAs should be inspected at least every five years and Treaty Parties should cooperate to avoid unnecessary duplication.
14. ATCPs should implement protective measures for HSMs as appropriate, including use of ASPA/ASMA designation if necessary.
15. ATCPs should ensure their operators consider historic/scientific values of abandoned work sites prior to approving site clean-ups.
16. ATCPs should consider conservation principals for assessment/management of all tourist operations and reflect on opportunities/constraints for tourism due to PA management.
17. ATCPs should encourage and support tourism research and monitoring including tourist impacts.
18. ATCPs should consider establishmenr/maintenance of Ant PAS database including open access.
19. That information regarding PAs be freely available to ensure compliance.
20. Treaty Parties should ensure that all expeditions comply with conservation measures and PA regulations.
21. CEP should develop an information strategy ro advise on collection, storage, evaluation of data related to PAs.
22. ATCPs should consider/discuss opportunities for applying international PA designations to areas of exceptional and universal conservation value in the Antarctic. Reference was made to the WHC, Ramsar and the Biosphere Reserve concept. Whilst direct application of these conventions may not be applicable, the ATS could apply "comparable criteria and procedures" to identify/protect sites in the Antarctic (Lewis Smith et al. 1994: 11).

(Lewis Smith et al. 1994)[29]

there is still work to be done. In addition to the outstanding issues highlighted by New Zealand's review, a number of recommendations from earlier workshops also require attention. The majority of the recommendations from the SCAR/IUCN workshop have since been addressed in one way or another, yet although efforts have been made to identify gaps in the Antarctic PAS, and to define or identify some form of systematic

Smith et al. 1994, Kakabadse 2000, Kaye et al. 2000, Richardson 2000, Valencia 2000, Wratt 2000, ATCM XXVIII / WP11 2005).

[29] For full detail and exact wording, refer to Lewis Smith et al. (1994).

Table 4.3 Tromsø 1998 Workshop on Protected Areas

Terms of Reference	
i. Categorise current Antarctic protected areas against the classifications provided in Annex V (Article 3.2) to identify any gaps.	**Findings:** The Antarctic PAS does have gaps. **Recommendation 1:** Urgent action must be taken to identify possible new protected areas, in particular areas kept inviolate from human interference, and representative examples of ecosystems.
ii. Examine the SCAR ecosystem matrices to identify improvements that may better reflect the categories in Annex V (Article 3.2).	**Findings:** SCAR ecosystem matrices found to be useful, however requires revision. **Recommendation 2:** The CEP, SCAR and IUCN should develop new systems for classifying protected areas based on existing knowledge and methods.
iii. If possible, identify potential protected areas to identify gaps in the Antarctic PAS.	**Findings:** Time did not allow for possible new protected areas to be identified. Instead the workshop focused on the processes that may aid area identification and selection, including criteria and gap analysis. **Recommendation 3:** ATCPs/CEP should consider the creation of database on Antarctic protected areas. **Recommendation 4:** ATCPs/CEP should undertake gap analysis and recommend new protected areas.
iv. examine and identify improved methods by which to identify, designate and review proposals for ASPAs.	**Findings:** There is a need for better guidance for those preparing management plans. **Recommendation 5:** ATCPs, CEP, SCAR and COMNAP should improve access to adopted management plans and the Guidelines on the preparation of management plans. **Recommendation 6:** The CEP should develop criteria for the review of management plans including a standardised reporting system. **Recommendation 7:** The CEP should consider how to review management plans for ASPAs designated for wilderness, aesthetic or historic values. **Recommendation 8:** The CEP should establish subgroups to address PAS issues. **Recommendation 9:** The TOR for such subgroups is set by the CEP **Recommendation 10:** The CEP should review the management plan process and improve it where possible.

(ATCP XXII/WP26 1998)

framework (SCAR 1961, 1972, CEP IV / WP12 2001, ATCM XXV / WP13 2002, ATCM XXVI 2003, ATCM XXVIII / WP2 2005, ATCM XXVIII / WP11 2005), the Antarctic PAS is far from comprehensive, systematic or representative (Overholt 1990, Lewis Smith et al. 1994, Kelleher et al. 1995, Clark and Perry 1996, Harris 2000, Valencia 2000, Gjerde 2003, Harris and Woehler 2004). Issues still outstanding from the Peru workshop include addressing gaps in the Antarctic PAS (areas inviolate and representative examples of all major ecosystems), a need to develop assessment criteria for sites designated for non- use/intrinsic values and call for the CEP to create an Antarctic conservation strategy. With these areas for improvement outlined, there is sufficient justification for a third protected areas workshop to be held based on the New

Table 4.4 Peru 1999 Workshop on Protected Areas

Terms of Reference	
i. Examine how the Antarctic PAS framework could be developed to incorporate: threats; provide guidelines and criteria to identify areas requiring special protection. ii. Develop better systems for categorising protected areas.	**Findings:** More detail is required in applying the protocol. The Guide for the preparation of management plans adopted at ATCM XXII should assist Parties (Resolution 2 (1998)). **Recommendation 1:** The CEP should elaborate on the framework for protected areas based on the conceptual categories of protection values (ecosystems, habitat, species, landscape, environmental features) or use values (science, conservation, economic, recreation/tourism, non-use/intrinsic). **Recommendation 2:** The CEP should consider elaborating on an Antarctic conservation strategy.
iii. Undertake a gap analysis; recommend new protected areas, with particular attention to areas to be kept inviolate from human interference, and representative examples of major terrestrial and marine ecosystems.	**Findings:** Gap analysis can be helpful but a more systematic process is required and/or environmental risk analysis **Recommendation 3:** That various tools be used in selection of protected areas, such as environmental risk analysis, quality and feasibility. Complementarity analysis may also be useful. **Recommendation 4:** When preparing and reviewing management plans an inventory of values should be included and an assessment of the effectiveness of protection of the assemblages in question. Unnecessary duplication should be avoided.
iv. Suggest how the CEP should review draft ASPA management plans and assist in the development of new plans.	**Findings:** Content and effectiveness of management plans must be considered systematically. **Recommendation 5:** A contact group should be formed for the review of management plans, to issue reminders of updates due, provide advice on revisions and monitor and report on the operation of management plans.

(Valencia 2000)

Table 4.5 New Zealand 2005 Review of the Antarctic PAS

i.	In order to create a more systematic/representative system of protected areas, sites in under-represented geographical areas or for under-represented environmental values should be researched.
ii.	The CEP should continue efforts to develop a 'systematic environmental-geographic framework'.
iii.	When considering new or revised Management Plans the extent to which plans complement the protected areas system as a whole should be considered.
iv.	The Guide to the preparation of Management Plans for Antarctic Specially Protected Areas, and Guidelines for Implementation of the Framework for Protected Areas Set Forth in Article 3, Annex V of the Environmental Protocol should be reviewed and updated if deemed necessary by the CEP.
v.	Management Plans should include a clear statement of the primary reason for designation.
vi.	Current Management Plans, maps and supporting information should be maintained on the Protected Areas Information Archive website.
vii.	The CEP should review the Moe Island plan and assess/update if deemed necessary.
viii.	Parties should ensure their management plans are updated to Annex V format.
ix.	Parties should also ensure sites due for review have been updated and management plans revised.
x.	The CEP should establish/maintain a register detailing Management Plan status to aid Parties in meeting their Annex V review requirements.
xi.	The CEP should revisit the list of recommendations included as Annex 5 to the Final Report of CEP III to identify and progress those issues still to be addressed.

(ATCM XXVII / WP11 2005)

Zealand report and the additional issues outlined here in order to provide ATCPs with next steps to improve the scope and effectiveness of the Antarctic PAS. Monitoring and surveillance of protected areas remains a challenge for ATCPs and is particularly pertinent relating to marine protection. SCAR and the IUCN's call for a comprehensive

tourism management strategy has never been addressed, although recently tourist guidelines were adopted for heavily visited tourist sites in the Antarctic to manage tourism impacts (ATCM XXVIII, Resolution 5(2005) and ATCM XXIX, Resolution 2(2006))[30]. The issue of considering international protected area designations and/or approaches in the Antarctic has been progressed, but as yet no single approach has been endorsed for the region outside the mechanisms of the Antarctic PAS, although IUCN conservation status has been used recently to assess the conservation status of Antarctic wildlife (ATCM XXVII / IP88 2004, ATCM XXVII / IP73 2004).

The best means by which to implement Annex V of the Madrid Protocol became a discussion point at the ATSCM XII held in September 2000. The guidelines for implementation of the framework for protected areas set forth in Article 3, Annex V of the Madrid Protocol were adopted under ATSCM XII, Resolution 1(2000). The guidelines were designed to assist Contracting Parties in assessing and defining ASPAs, providing Parties with criteria to assist in evaluating their appropriateness for inclusion in the Antarctic PAS and a format for developing proposals for site designation.

The 2003 Guidelines for CEP Consideration of New and Revised Draft ASPA and ASMA Management Plans specify that any sites with a marine component are subject to SCAR/CCAMLR Commission approval (CEP 2003)[31]. Later at XXVIII ATCM, Decision 9(2005) on MPAs and other areas of interest to CCAMLR stated that Commission approval is required for draft management plans that contain marine areas subject to harvesting (or potential harvesting) activities, if the areas may be affected by site designation (including CEMP sites), and if the measures within the management plan may prevent or restrict CCAMLR related activities (para's 1 and 3). SCAR provides recommendations to the CCAMLR Commission, which may either request modifications or recommend its adoption to the CEP. Commission approval is necessary for such sites (both ASPA and ASMA) prior to any decisions being made (para. 2). The example of Terra Nova Bay demonstrates efforts for cooperation between

[30] It is also worth noting that in 1995 guidelines were created regarding the identification and designation of HSMs, detailing some criteria that the proposed site should meet such as, inter alia, the site of an important scientific or exploration event or achievement, of educational or informative value (ATCM XIX, Resolution 8 (1995)).

[31] At XXII ATCM, Decision 4(1998) reiterated that this requirement, but was later superseded by XXVIII ATCM, Decision 9(2005).

ATCPs and CCAMLR Commission members regarding sites of mutual interest (SCAR-LSSSG 2004).

In 1999, the New Zealand delegation submitted a working paper proposing an extension of ASPA No. 4 to include an extended MPA around Balleny Islands, including a draft management plan (ATCM XXIII / WP31 1999). At CEP III (2000, para's 91 to 97), New Zealand expressed concerns regarding the requirement that any sites with a significant marine component were subject to CCAMLR approval (CEP III, para's 92 and 93). New Zealand urged the CCAMLR Commission to clarify the process for assessment and approval for areas with a significant marine component. The extended MPA has yet to be approved over six years later, despite the fact that in 1999/2000 the CCAMLR Working Group on Ecosystem Monitoring and Management confirmed the scientific validity of the proposal and that the site contained outstanding examples of marine and terrestrial biological diversity (CEP III, para. 93)[32]. With this in mind, any system of MPAs for the Antarctic, therefore, must be developed in collaboration with the CCAMLR Commission to ensure that the system operates in harmony with the objectives of conservation and rational use and to follow the CCAMLR process to maximise their support of any approaches taken.

The new Annex VI on liability requires Parties to take measures to prevent environmental emergencies and in the event of an emergency, to undertake response actions, and represents an important step in the evolution of the ATS since it has been under negotiation since 1991. The liability Annex, once it enters into force, could have substantial conservation implications as it gives legal substance to the requirement to have contingency planning and preventative measures in place relating to environmental emergencies.

The adoption of the ecosystem approach and precautionary approach under the Madrid Protocol indicates a strong sense of stewardship for the Antarctic environment. Furthermore, the numerous measures addressing species and *in-situ* and *ex-situ* conservation that apply within the region demonstrate the ongoing interest of Treaty Parties in the conservation of the Antarctic. Despite the shortcomings of the Antarctic PAS, the instruments of the ATS do provide the necessary framework for adequate and

[32] See also Burgess et al. (2003) for an analysis of the events relating to the Balleny Islands proposal.

representative conservation in the form of protected areas. It is implementation of those areas, and the provision of selection guidelines that has been lacking to date. In the life of the ATS, there have been 15 different protected area classifications. Table 4.6 describes the classifications and number of Antarctic protected areas effective as at 01 March 2006.

4.7 Summary

The instruments of the ATS have evolved over the last half century to provide for the comprehensive protection of the Antarctic environment. Effective conservation is commonly acknowledged as requiring conservation of species, *in-situ* conservation, *ex-situ* conservation whilst embracing a sense of stewardship. The ATS provides for each of these approaches. Species are afforded various levels of direct and indirect protection within CCAS, CCAMLR and the Madrid Protocol. Sites can be set aside for protection within the provisions of CCAS, CCAMLR or the Madrid Protocol. The Antarctic ecosystem is also afforded protection, with CCAMLR taking a particularly early ecosystem approach, in addition to the regional protection provided for within the Antarctic Treaty, CCAS, CCAMLR and the Madrid Protocol. Numerous ATCM recommendations, decisions, resolutions and measures guide human behaviour in all aspects of the environment to protect the dependent and associated ecosystems in the Antarctic.

In 1991 the IUCN stated that the Antarctic was amongst the most comprehensively protected regions in the world, but that improvements were still required (IUCN 1991, Kelleher et al. 1995). The protective measures in place under the Madrid Protocol support this assertion even today, particularly considering permit controls, protected areas and species and the EIA requirement for activities conducted in the Antarctic. The 2005 review of the Antarctic PAS highlighted ongoing challenges regarding the PAS (ATCM XXVIII / WP11 2005), which is acknowledged as being deficient in its representativeness and that, *inter alia*, more marine protected areas are advised. The question remains as to whether the ATS is sufficient, or whether it could benefit from the application of alternative approaches or instruments of the global conservation movement. Certainly, in terms of improving the reach of the ATS, adopting or advocating alternative international approaches could be of some use. The recent

Table 4.6 Area Classifications under the Antarctic Treaty System

Year	Area Classification	No. Sites	Adoption
1961	Historic Sites and Monuments (HSM)	80	Recommendation I-9, (1961); Recommendation V-4 (1968)
1964	Specially Protected Areas (SPA): biological sites of outstanding scientific interest set aside for conservation and preservation	n/a – see ASPA	Agreed Measures, Annex VIII, Recommendation III-8
1972	Sites of Special Scientific Interest (SSSI): to protect sites for scientific investigation from wilful or accidental interference where a demonstrable risk of interference is present	n/a – see ASPA	Recommendation VII-3 (1972); Recommendation VIII-3 (1975)
1972	Seal Reserves	3	CCAS, Article 3 and Annex, para. 5
1972	Sealing Zones	6	CCAS, Article 3 and Annex, para. 4
1975	Areas of Special Tourist Interest (ASTIs) (None designated)	0	Recommendation VIII-9
1981	Tomb	1	Recommendation XI-3
1985	CCAMLR Ecosystem Monitoring Program (CEMP)	2	CCAMLR
1987	Marine Sites of Special Scientific Interest (MSSSI)	n/a – see ASPA	Recommendation XIV-6
1989	Specially Reserved Areas (SRAs)	n/a – see ASPA	Recommendation XV-10, (never entered into force)
1989	Multiple Use Planning Areas (MUPA)	n/a – see ASMA	Recommendation XV-11 (never entered into force)
1991	Antarctic Specially Protected Areas (ASPA, subsumed SPA, SSSI, MSSSI and SRA)	64	Madrid Protocol, Annex V, Article 3
1991	Antarctic Specially Managed Areas (ASMA, subsumed MUPA)	4	Madrid Protocol, Annex V, Article 4

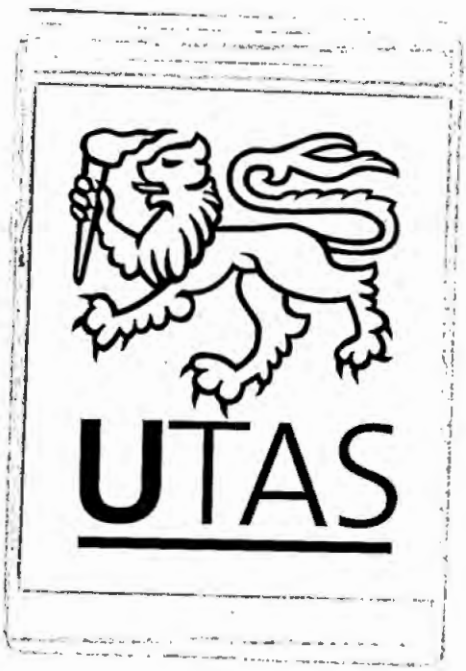
(CEP 2005)[33]

consideration that ATCPs have given to alternative instruments and approaches suggests that the ATS already recognises the value of these actions.

The ATS now grants observer status and takes scientific advice from many international organisations and NGOs such as the IUCN, UNEP, ASOC, IMO, amongst others. Recently, CCAMLR invited Mauritius and Namibia to attend their COP to influence the latter's inadvertent support of IUU fishing through providing port landing facilities (Vidas 2000). Subsequently Namibia became a member of the Commission, and Mauritius is an acceding state. ATCM observers have also emphasised the importance of marine protection in the Antarctic, including the IUCN (ATCM XXII / IP51 1998) and ASOC (ATCM XXV / IP101 2002), and the CCAMLR Commission at their recent Workshop (CCAMLR Commission 2005a). The need to look towards international environmental practice was acknowledged, and also discussed by SCAR at the 2005

[33] Additionally, the Antarctic was referred to as a 'special conservation area' under the Agreed Measures, and a 'natural reserve devoted to peace and science in the Madrid Protocol (Article V-2).

ATCM together with a need to update the Antarctic conservation strategy to a relevant and holistic approach (ATCM XXVIII, para. 206). The framework set up within the ATS is well equipped to accommodate future improvements for the protection of the environment. These questions have been explored in Chapters 3 and 4. The following Chapter builds upon these assessments and discusses how best to approach Antarctic marine conservation either within or beyond the ATS.



Chapter 5

5 ANTARCTIC MARINE CONSERVATION: POSSIBLE INSTRUMENTS AND APPROACHES

The establishment of a systematic environmental and geographical framework of protected areas within the Antarctic region has yet to be achieved

(Kelleher et al. 1995: 55)

5.1 Marine Conservation in Context

The high seas represent 50% of the earth's surface and 64% of the world's oceans (Gjerde and Breide 2003). The marine living resources of the high seas are in urgent need of protection, primarily to address ever-increasing threats but also to protect the intrinsic values of the marine environment (Gjerde and Breide 2003). The marine environment and its living resources are subject to a number of threats including, *inter alia*: climate change; fisheries related pressures (e.g. over-exploitation; over-capitalisation; IUU fishing; by-catch); land-based pollution and pollution from ships; habitat loss and destruction, and introduced and alien species (Kimball 2001, Gjerde and Breide 2003). Traditionally marine living resources have been seen as infinite or boundless and conservation and protection has often been a secondary concern (FAO 1996). Knowledge and understanding of the marine environment is limited, and as a result marine conservation initiatives lag significantly behind terrestrial conservation (Jones 2001). Monitoring and enforcement of measures for the protection of marine living resources (e.g. MPAs, species protection) is problematic and costly, and can undermine the effectiveness of instruments for the protection of the marine environment and its resources (Croxall and Nicol 2004).

Anthropogenic climate change, in addition to natural climate change, poses a major threat to the marine environments of the world as it can alter ecosystem functioning by changing the process of photosynthesis, lead to sea level rise, alter oceanic circulation, increase coastal storm damage and species survival, influence and change species' distributions and migratory routes (Kimball 2001, Han et al. 2002, Gjerde and Breide 2003, Oppenheimer 2005). A complicating factor relating to climate change, however, is that there is no scientific agreement as to the time frame and extent to which climate

change will occur, and how well species and ecosystems will adapt to such change (Oppenheimer 2005). Threat mitigation has been the motivation of the majority of conservation initiatives, and as a result the measures put into place addressing these issues have in many cases been *ad-hoc* and generally uncoordinated. The Antarctic is recognised as an area particularly sensitive to climate change (Robinson et al. 2003). Antarctic wildlife has adapted to the extreme conditions and is especially vulnerable to climate change (UNEP 1999). Changes in sea-ice extent can alter the surface absorption of solar radiation, which may lead to increased greenhouse emissions, altered radiation balance, and most critically, could irreversibly transform global ocean circulation and water mass exchange (UNEP 1999).

Of more immediate concern are fisheries and other commercial resource extraction, which are serious ongoing threats to the marine environment. Traditional species management has failed to adequately govern fisheries effort. Many major international fisheries are over-fished or fully fished, and related issues of by-catch and high levels of discards are major issues in the industry (FAO 1996, FAO Fisheries Department 2003, 2004). Marine debris, including fishing gear, can result in marine wildlife ingestion and entanglement and affect species' mortality rates (Gjerde and Breide 2003). UNEP's Global Environmental Outlook 2000 (1999) reported albatross mortality due to longlining at around 44,000 annually for the Indian sector of the Southern Ocean (FAO 1996). In 1999, UNEP reported that the legal catch of Patagonian toothfish in Antarctic was 10,245 tonnes, whilst the illegal catch was estimated at over 100,000 tonnes just in the Indian sector of Southern Ocean alone (UNEP 1999, Croxall and Nicol 2004). Overfishing can irreversibly alter predator/prey relationships, species composition and distribution and can ultimately lead to fisheries collapse. Fisheries have also fished down the food web, whereby the largest species are over-fished to the point of collapse, causing the fishery to refocus their efforts onto the next largest species and repeat the pattern – a key example of this is whaling (Wing 2001, Ainley et al. 2006). These patterns can pre-empt major changes in ecosystem structure and function and cause irreversible damage. IUU fishing and the use of flags of convenience compounds these issues both within and beyond national jurisdiction. Changes in jurisdiction under LOSC have led to fisheries displacement, increasing pressures on high seas marine living resources and conflicts at the boundaries of areas under national jurisdiction (Bergin and Haward 1995, Kimball 2001). Furthermore, over-capitalisation of the fisheries industry

and growth in trade means that pressure on the marine environment is only likely to increase (Gjerde 2001, Kimball 2001, Wing 2001). Bioprospecting and deep seabed mining pose further possible risks to the marine environment in the future (Gjerde 2003, Gjerde and Breide 2003).

Pollution from ships has long been recognised as a threat to the marine environment, but it is now understood that the greatest source of pollution of the world's oceans is from land-based sources – comprising up to 70% or marine pollution (United Nations 1992). Bioaccumulation of persistent organic pollutants (POPs) in marine living resources poses a threat not only to those resources but also to humans who consume them (Kimball 2001). POPs have been found present both in the Arctic and Antarctic due to long-range transport (UNEP 1999, Goerke et al. 2004).

Globalisation of the world economy has increased the number of ships in passage and so increases not only potential pollution from ships, but also the risk of accidental pollution (e.g. oil spills), collisions or damage in congested shipping lanes, and introduced species being transported in ballast water (Kimball 2001, Wing 2001, Allison et al. 2003). Ocean-borne trade may double in the next 20 years (Gjerde and Breide 2003). In the Antarctic, ships are used to transport oil to stations, and in 1999 the Council of Managers of National Antarctic Programmes (COMNAP) reported to ATCM XXIII that there were 73 oil spills in the years between 1988 and 1998 reported by 17 of the 29 Antarctic programmes, resulting in the loss of over 200 litres of oil into the environment (ATCM XXIII / WP16 1999). Furthermore, COMNAP recognised a shipping accident resulting in a loss of fuel (bunker fuel or cargo) as the worst-case scenario for environmental damage to the Antarctic marine environment (ATCM XXVI / WP09 2003).

Introduced species can alter ecosystem functioning and structure and can be very difficult to reverse if allowed to establish. The rise in global trade via shipping has also seen major problems with marine introductions through ships' ballast water. Some commentators suggest that alien marine introductions represent amongst the greatest threats to the world's oceans (Endresen et al. 2004), and has recently been addressed by the creation of the BWM Convention that has yet to enter into force. As discussed in Chapter 2, under the BWM Convention Contracting Parties are obliged to prevent,

minimise and ultimately eliminate the transfer of harmful aquatic organisms and pathogens through the control and management of ballast water and sediments (Article 2). Parties may also, individually or jointly, agree to take more stringent measures for the prevention of marine pollution and invasions by ballast water than those set forth in the BWM Convention.

5.1.1 The Antarctic

Under the governance of the ATS, the Antarctic is one of the most strictly protected and managed regions of the world (Kimball 2001). Chapter 3 described the ATS as a unique system that has seen interested States set aside disagreements on territorial claims in the pursuit of science and the peaceful use of the continent and surrounding seas. The Antarctic Treaty is an instrument that has demonstrated an ability to adapt to changing priorities by the adoption of new measures and instruments for the protection of the Antarctic environment. Chapter 3 outlined the various measures for Antarctic conservation set forth within the instruments of the ATS. The ATS demonstrates a strong notion of stewardship and adopts a comprehensive approach to conservation of species and areas as well as outlining numerous *ex-situ* measures.

The Southern Ocean region, with the exception of a few subantarctic islands generating EEZs, comprises high seas, and represents approximately 10% of the world's oceans (UNEP 1999). Since the high seas are subject to open (though qualified) access under LOSC, this presents challenges for the implementation of international law. Whether within or beyond the ATS areas of application, all States arguably have the right to fish under the LOSC (Articles 33, 55, 56), the freedom of innocent passage and the right to conduct scientific research within the Southern Ocean, amongst other rights (e.g. laying of submarine cables). However, States exercising these so-called freedoms of access could undermine the conservation and sustainable use of high seas marine living resources (Kaye 2004). Many Southern Ocean islands are under national jurisdiction, although in some cases conflicting territorial claims do exist (e.g. the Falkland Islands/Islas Malvinas). The application of international instruments such as the CBD, LOSC and WHC generally apply to areas within national jurisdiction, which can cast their potential application to the high seas into doubt.

Governance of the Antarctic, including the Southern Ocean, is complex. The Antarctic is a special case as, although it lies in the high seas, like-minded States have agreed upon

a set of measures under the ATS that govern their activities in the Antarctic. The Antarctic continent is subject to territorial claims of seven States (Argentina, Australia, Chile, France New Zealand, Norway and the United Kingdom, some of which are overlapping). These claims are not recognised by some States (e.g. USA and the Russian Federation) (Migliorino 1996, Vidas 2000, Kaye 2001, Bush 2002). Australia has asserted their claim to Antarctic territory by declaring an EEZ around their territory, however this claim may not be recognised by all States and any such claims may reignite the sovereignty debate (Green 2001). Maritime claims are not generally pursued in the Antarctic. For example, although Australia has declared a 200nm EEZ off the Australian Antarctic Territory, laws only apply to Australian nationals so as not to conflict with CCAMLR and the ATS (Migliorino 1996, Green 2001, Grant 2005, Jabour 2006a). Whilst ATPs are legally governed by the measures set forth within the instruments of the ATS, they cannot usually enforce those obligations on other non-Party States conducting activities in international waters. In such circumstances the only recourse is to inform the third-Party State of the measures that apply to the region under the ATS and ask that they voluntarily comply.

As briefly mentioned in Chapter 4, Malaysia raised the "Question of Antarctica" at the 1983 United Nations General Assembly (UNGA) as a matter of urgent attention (Mitchell 1985, Beck 2004). Malaysia argued (with the support of other States) that the Antarctic should, like the high seas seabed, be the common heritage of mankind (Vidas 2000). The 1980s saw great division between States in favour of the existing ATS and those supporting UN involvement and the common heritage principle. The UN "Question of Antarctica" debates also gave NGOs such as ASOC a chance to raise the issue of environmental protection and conservation to the ATPs (Beck 2004). In the 1980s there was also some argument that the Antarctic should be designated as a World Park, with support from Australia and France (Rothwell 1990). This was followed by the collapse of negotiations on CRAMRA and the subsequent adoption of the Madrid Protocol, which had a greater emphasis on conservation than earlier instruments. By this stage, there was growing acknowledgement from the UN, and even by Malaysia – the proponent of much of the criticism, that the ATS was operating well and had positive qualities (Tepper and Haward 2005), particularly with the adoption of the Madrid Protocol and the mining ban (Beck 2004).

The Antarctic region, with no permanent population and limited human development, is subject to substantially less direct anthropogenic pressure than elsewhere on the globe. However, the Southern Ocean is subject to the same threats as rest of the world's oceans and can no longer be described as pristine, although it is still frequently portrayed as such. Climate change, commercial resource extraction, and pollution are perhaps the three most immediate threats to the region. Seals and whales were once heavily exploited in the region to the point of near extinction (UNEP 2002). In 1960 Carrick reported that "the main threat to Antarctic wildlife has yet to materialize; but if, as has been suggested, a food-hungry world were to turn to the Antarctic seas for supplies, and if the lower organisms in the food-chains were to be taken in quantity, this could have profound and permanent effects on higher vertebrates such as whales, seals and birds" (Carrick 1960: 303). In 1961 SCAR cautioned that "...all forms of exploitation should be discouraged until adequate scientific data are available" (SCAR 1961: 540).

The Antarctic is known to be of high scientific value and science was one of the key factors driving the development of the ATS. The Antarctic is known to be particularly sensitive to climate change and is widely recognised as an important region for research and monitoring for the early detection of climate change. Changes in the physical environment can impact on Southern Ocean fisheries and ecosystem and there is already evidence of changing sea-ice extent and consequent impacts on krill behaviour (Fraser and Hofmann 2003, Croxall and Nicol 2004). Changes in UV-B radiation may instigate altered primary production in the region (Han et al. 2002, Croxall and Nicol 2004). In recent years icebergs and ice-shelves appear to be experiencing collapse more frequently, and in some cases icebergs have approached the continent, grounded and prevented adult penguins from reaching feeding areas, resulting in low breeding success. To a degree this is part of a natural process, however there is some question regarding whether anthropogenic climate change has increased the variability, frequency and duration of these events, or altered sea-ice extent, the impacts of which can be catastrophic (Ainley et al. 1998, Wilson et al. 2001, Ainley et al. 2006). Due to the isolated nature of the Antarctic, relative to other areas of the world, it represents a key region for baseline research as some areas in the Antarctic still remain relatively unaffected by human activities by comparison to other global regions (IUCN 1991).

Science is the primary activity being undertaken in the Antarctic, and any State undertaking significant research activities are entitled to become a Consultative Party to the Antarctic Treaty and participate in the decision-making process. Scientific activities can have a detrimental impact on the environment too and need to be subject to regulation and management (Johnson 2005, 2006). Scientific impacts are strictly managed through the instruments of the ATS, with access to Protected Areas only via a permit, and all activities with the potential of having a more than minor or transitory impact being subject to impact assessment prior to proceeding.

Antarctic tourism has increased steadily over the past few decades and in particular since the 1980s (Murray and Jabour 2004). Although the Antarctic region has relatively few visitors in comparison to world tourism trends, a couple of key factors are cause for potential concern. The International Association of Antarctica Tourist Operators (IAATO) self-regulate tourist activities in the Antarctic and impose a Code of Conduct on their members. However being 'soft' law, the Code of Conduct is not legally binding on operators, and in fact not all tourist operators are members of IAATO. Antarctic tourist operators tend to visit the same localities repeatedly. Visitation to the Antarctic Peninsula and subantarctic islands are concentrated in the same areas and within a very short summer period due to the harsh climatic conditions and accessibility being limited to the Antarctic summer months when the sea-ice is at its minimum. Furthermore, the Antarctic is also subject to growing numbers of adventure and independent tourists who may not be aware of, or adhere to, current environmental guidelines or regulations. The growing number of tourists in the region presents greater environmental pressures in geographically distinct sites, greater risk of accidents or strandings and the cost of rescue or remediation operations in the region is exceptionally high (see Murray and Jabour 2004 for examples). IAATO have been commended for their efforts in controlling tourist impacts, but there is a need to consider the ongoing impacts (potential and known) in conservation planning for the region (Kelleher et al. 1995, Anon. 2004). The possibility of an additional Annex to the Madrid Protocol relating to tourism has been raised in the past, but as yet ATCPs have not pursued this further (Murray and Jabour 2004).

The Antarctic region has been governed by the instruments of the ATS for nearly 50 years. Political differences have largely been set aside and the result has been a

remarkable set of international instruments that have operated with considerable success. The ATS has shown considerable flexibility and progression in the level and type of protection afforded to the region. Traditionally the ATCPs had seemingly avoided association with international organisations, such as the UN, in relation to the Antarctic (Dodds 2000, Rothwell 2000, Grant 2005). However in recent years greater consideration has been given to international instruments and approaches and their relevance/appropriateness in the Antarctic region (ATCM XXVIII / IP85 2005, ATCM XXVIII / WP2 2005). A significant step in this process was made in 1991 with the joint SCAR/IUCN report on A Strategy for Antarctic Conservation, which considered the applicability of other instruments and approaches in the Antarctic (IUCN 1991). The next section considers the importance of taking a comprehensive approach to marine conservation, and then explores how international law may be able to be applied in the Antarctic.

5.2 Working within a Conservation Framework

The existence of threats to high seas marine living resources calls for the adoption of conservation measures via international instruments and approaches. Chapter 2 considered international approaches – both hard and soft law – for the protection of the environment, whilst Chapter 3 focused on the instruments of the ATS. The measures set forth in international law can generally be classified within three key conservation approaches[1]: species[2], *in-situ* and *ex-situ* conservation, as outlined in Chapter 2. The notion of stewardship applies across these three areas. Instruments that apply measures across species, *in-situ* and *ex-situ* conservation have the greatest potential to generate positive environmental outcomes as they take a comprehensive approach to the protection and preservation of the environment. Conservation outcomes are likely to be enhanced if instruments advocate the precautionary and/or the ecosystem approach. The application of the precautionary approach in the marine realm is particularly vital as there is a paucity of data available on the processes and interactions of the marine environment.

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[1] These three areas do not represent the only methods that can be applied for environmental conservation, but are used to simplify and categorise the most prevalent methods.

[2] Of course, if a species is protected under a global, regional or local instrument, then is it protected irrespective of its location (but generally within the bounds of national jurisdiction, except with agreements such as CMS/FSA/ACAP whereby species are protected across their Range). In this respect there is some overlap of species conservation and *in-situ* conservation. However, here the species and *in-situ* conservation are treated separately.

Conservation initiatives have traditionally been implemented once evidence of damage or a substantial threat or risk is present. This type of reactive conservation was, for the majority of the 20th century, the approach adopted by most States and instruments. Many conservation instruments were developed as a result of reactive management, such as (but not limited to) ICRW, Ramsar, CITES, CMS and CCAS. Conservation initiatives, such as designating protected areas, were once only justifiable if a threat was present. Conservation theory (and increasingly conservation practice) now advocates the protection of areas even if there is not a substantial threat or risk present. Conservation measures may be implemented to accommodate one or more uses, such as scientific; commercial or economic; recreational and tourist; conservation and preservation purposes. Some protected areas are created to manage conflicting uses and allow for multiple use of an area which may vary from strict protection through to commercial extraction. Conservation values may include: species protection and management; habitat protection; ecosystem conservation; protection of landscapes or features, or historic and cultural features (de Freitas 2000, Gustavo 2000). Proactive conservation, the precautionary approach and the ecosystem approach all mark a change in conservation thinking towards a more progressive era that seeks to prevent and anticipate irreversible impacts before they occur.

5.2.1 Species Conservation

Species conservation is important in curtailing the risk of extinctions and endangerment and is frequently applied when a conspicuous decrease in the population, habitat or range of a species has occurred, or where a major threat to a species is present or likely. Habitat degradation and destruction are leading factors contributing to species decreases on land, whereas at sea commercial fisheries present the greatest threat to marine living resources (Gubbay 1995). Fisheries management has generally applied species-based approaches to conservation and sustainable use of target species, however traditional fisheries management has largely failed to prevent stock collapse, address by-catch issues and prevent habitat damage from destructive fishing practices (Ward et al. 2000, Kaye 2004). Chapter 3 discussed that the Southern Ocean has also been subject to major whaling, sealing, and more recently krill and finfish fisheries (Kaczynski 1985, Constable et al. 2000, Ward et al. 2000, see examples cited in Kaye 2004) and this overexploitation led to the development of numerous instruments or measures to address the conservation and management of marine resources (Gjerde 2001).

There is now widespread recognition that a single species approach is inadequate when applied in isolation of other conservation methods. The single species approach fails to recognise the wider ecosystem (e.g. predator-prey) interactions or issues such as non-target species by-catch (Ward et al. 2000). The ecosystem approach considers the essential processes, functions and interactions among organisms and their physical environment. In theory the ecosystem approach has more environmental credibility than a single species approach as it incorporates this scientific understanding into conservation planning (CBD Liaison Group on the Ecosystem Approach 1999).

5.2.2 *In-situ* Conservation

In-situ conservation, commonly known as area protection, is a widely recognised and adopted conservation technique and protected areas are considered to be a leading means of protecting biodiversity *in-situ* (Green and Paine 1997). Protected areas, whether marine (MPAs) or terrestrial (TPAs), are geographically distinct sites that are (or should be) managed in order to protect the values of the site. Management can be stringent (no use or access) or may allow for multiple uses, including extraction. TPAs are generally easy to define as they can be readily delimited, marked and managed. MPAs present greater challenges due to their interconnectedness and logistical difficulties such as delineation, monitoring and enforcement of management measures, particularly in the high seas (Jones 2001, Andersson et al. 2003). The majority of MPAs that have been designated are within national jurisdiction and coastal regions (Gjerde and Breide 2003).

The IUCN recommend that States set aside a minimum of 10% of their region within protected areas, using their six protected area classifications as outlined in Chapter 2. An assessment of the world's protected areas found that two thirds of all countries have under 10% of terrestrial areas within protected areas, and 20% have under 1% of their region designated as protected areas (Green and Paine 1997). Marine areas are significantly under-represented world-wide and not all IUCN categories have adequate coverage (Green and Paine 1997). On average, only 1% of each biogeographic region is set aside as MPAs (Kelleher et al. 1995).

The development of protected area networks around the world has been somewhat arbitrary, and only in the late 20th century was there recognition that in order for protected area networks to be effective in conserving biodiversity, there was a need for

criteria and guidance in their selection and prioritisation. Selection guidelines are now provided for instruments such as the WHC, Ramsar, MAB and IBA Program. Transboundary marine reserves are rare but are increasingly being raised as a solution for marine conservation (IUCN 1998). Recently there has been recognition of the need to include high seas MPAs within the global representative system of MPAs, most notably at the 2002 WSSD, which set at target of 2012 for the establishment of a representative network of MPAs (Gjerde and Breide 2003). There is still considerable debate regarding the question of what constitutes adequate representation (Balmford et al. 2004, Kelleher et al. 1995, Brooks et al. 2004). Additionally, workshops have been held to specifically address the concept of high seas MPAs at the Isle of Vilm (Germany) in 2001, Malaga (Spain) in 2003 and Cairns (Australia) in 2003 (Gjerde 2003, Gjerde and Breide 2003). International instruments that have started to address transboundary or high seas issues include LOSC, MAB Program, CBD (the Jakarta Mandate), Agenda 21 and some instruments of the ATS.

The planning and implementation of any PAS, whether marine or terrestrial, generally requires substantial amounts of information on the characteristics of the region. In the Antarctic this poses a problem, particularly in the marine region but also on the continent itself, since there is no permanent population and the harsh environmental conditions make data collection challenging and costly. There is also a strong geographical bias in the data – for example, the Antarctic Peninsula is more data rich than Eastern Antarctica. Therefore, the systematic selection of areas for protection in the Antarctic is hindered by insufficient data (Kelleher et al. 1995). A decade ago Green and Paine (1997) named Antarctic as one of the least well represented regions in the world in terms of protected areas[3]. Not all IUCN protected area categories were represented, with the majority of Antarctic protected areas Category 1a – Strict Nature Reserves primarily available for research and monitoring (83% of all Antarctic protected areas in 1999)[4]. In 2005 New Zealand assessed the Antarctic PAS and found that the areas set aside in the Antarctic covered just 0.008% of the Treaty Area (ATCM XXVIII

[3] In 1997, Antarctica had 99 protected areas in total covering an area of 3,788km² or 0.03% of the region (Green and Paine 1997).

[4] Allocation of protected areas into the IUCN categories is subject to interpretation. Green and Paine (1997) do not, for example, classify CCAMLR regions and subregions as a protected area, although within these regions conservation measures do apply that aim to manage the target resources, including dependent and associated species. Furthermore, although the primary purpose of protected area designation may be for scientific research, in some cases areas may also serve other purposes. An example of this is ASMAs that allow for cooperation and multiple-use.

/ WP11 2005), and SCAR reported that spatially explicit conservation planning in the Antarctic lags far behind the rest of the world (ATCM XXVIII / IP85 2005).

Chapter 3 considered shortcomings of the Antarctic PAS, identifying that the Antarctic does not have ecologically and geographically representative coverage of all major ecosystems, a lack of areas inviolate of human activities, the type locality or only known habitat of species and MPAs, and not all protected area classifications or value types are represented (Gustavo 2000, Valencia 2000, ATCM XXVIII / WP11 2005). In particular no sites have been designated primarily for protection of intrinsic, conservation or aesthetic values (Green and Paine 1997). It has also been suggested that sites with tourist values and that are therefore susceptible to human impacts could be managed within the ASMA classification (Kakabadse 2000)[5]. Traditionally, protected areas have been designated in the presence of a threat to species, habitats or ecosystems, or for the protection of the intrinsic values of a site. It is no longer considered necessary for there to be an imminent threat to a site prior to implementing protective measures.

Area protection remains one of the most effective means by which to protect species and their habitats. The role that MPAs and TPAs play is critical to the success of any conservation strategy since protected areas facilitate species conservation at critical life-cycle stages: breeding; spawning and nursery grounds; feeding areas and in some cases, protection from exploitation. Protected areas, particularly in the marine environment, can play a role in species recovery and rehabilitation although in some cases recovery times can be substantial when fish stocks have been severely depleted (Salomon 2004, McClanahan and Graham 2005).

5.2.3 *Ex-situ* Conservation

Ex-situ conservation measures to an extent overlap with the notion of stewardship, and refer to more general approaches that promote conservation such as captive breeding programs and species recovery centres, research and development, information exchange, cooperation, advocacy, training and education (e.g. Article 9 of the CBD). All international instruments encourage and facilitate research and information exchange at regular COPs. Parties to international agreements regularly meet to discuss their

[5] Although there was allowance for Areas of Special Tourist Interest (ASTI) under the Agreed Measures, none were ever designated (Recommendation VIII-9(1975)).

implementation and it is now commonplace for international organisations or third-Party States to be invited to COPs to ensure a consistent application of their common principles such as conservation and sustainable use. Additionally, most instruments have established scientific bodies, committees or commissions whose purpose is to provide advice and support to Parties, to undertake and encourage scientific research and collaboration and sometimes to monitor and enforce compliance.

Since the 1990s there has also been a trend towards the development of cooperative relationships between States, international bodies and instruments. Often known as MOU these agreements symbolise the recognition of mutual interests between independent bodies and agreements (e.g. the CMS has numerous MOUs that address at-risk species). LOSC is an example of an instrument that strongly encourages cooperation between Parties, regional fisheries bodies and international organisations for responsible marine resource use and it specifically addresses the conservation of marine mammals of the high seas in Articles 65 and 120. The CBD has developed MOUs and joint programs of work with CMS, CITES, Ramsar and WHC (the joint program with WHC is still in development) (Ramsar 2005).

Few instruments refer explicitly to the concept of *ex-situ* conservation. The CBD is an exception and places obligations on Parties to establish and maintain species recovery and rehabilitation centres, to conduct research, to regulate and manage collection of species for *ex-situ* conservation purposes and to provide financial and other support for developing States' conservation efforts under the CBD. Instruments that place requirements on Parties for species or habitat recovery and restoration are WHC, MAB, Ramsar, CITES, CMS, CCAMLR, and Agenda 21. Statements encouraging Parties to identify and create measures necessary to fulfil the objectives of the agreement, including *ex-situ* conservation methods may be included in agreements. MARPOL 73/78, for example, provides *ex-situ* conservation measures that include controlling for marine pollution or land-based pollution of the marine environment. Contingency planning and impact assessments are also examples of *ex-situ* conservation since they attempt to anticipate and minimise environmental impacts prior to activities proceeding, and plan how to respond to emergency and unforeseen events. The Madrid Protocol, CBD and Agenda 21 address these issues.

5.2.4 Summary

Chapters 3 and 4 considered the instruments of the ATS and other possible international instruments and approaches that may warrant consideration for application in the Antarctic or high seas. Table 5.1 summarises the key features of each instrument considered in this research by their conservation framework (species and *in-situ* conservation[6]), their applicability to coastal and high seas regions, their progressiveness (ecosystem and precautionary approach[7]) and their status (date of signature, entry into force and number of Contracting Parties or participating States). International instruments and approaches are listed in the order in which they were signed or adopted, followed by the instruments of the ATS. Measures for species conservation by key instruments are described in Table 5.2, whilst Table 5.3 briefly summarises measures for *in-situ* conservation.

5.3 Discussion

5.3.1 The ATS as a Framework for High Seas Southern Ocean Conservation

One option for Antarctic marine conservation is to continue to use only the instruments of the ATS within the Antarctic region. The ATS has been in operation for nearly half a century and has proven to be adaptable and resilient, effectively accommodating evolving priorities and interests in the Antarctic region. The question is, however, whether the ATS can continue to cope with changing environmental, social and economic demands, and how the ATS may evolve to this end.

The Antarctic Treaty has enabled the adoption of various instruments and measures, and each instrument has been developed in such a way as to consider the interactions with other instruments in the ATS. Furthermore, the instruments address relevant international instruments that were in force at the time of their adoption. Unfortunately, the Antarctic Treaty, CCAS and CCAMLR were all developed prior to LOSC being adopted, under which open access on the high seas was reiterated. This may be an area of potential confusion regarding the duties and obligations of Parties in the Antarctic, as mentioned in Chapter 3.

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[6] *Ex-situ* conservation covers a broad range of conservation initiatives from research to advocacy, hence is not included in the table as all instruments facilitate this type of conservation in one way or another.

[7] For the purposes of this research, instruments are considered to advocate the precautionary approach if they explicitly mention the precautionary approach/principle, or if they were implemented previous to a threat/damage being evident (i.e. not relying on the burden of proof).

Table 5.1 Summary of Selected International Environmental Instruments

Instrument / Approach	Species	*In-situ*	Coastal and High Seas	Ecosystem Approach	Precautionary Approach	Signed	Entry into Force	Status (b)
International Instruments and Approaches								
ICRW	✓	✓	✓	✗	✗	1946	1948	66
MAB	(✓)	✓	(✓)	✓	(✓)	1970	✗	(102)
Ramsar	(✓)	✓	(✓)	✓	✗	1971	1975	150
WHC	(✓)	✓	(✓)	✓	✗	1972	1975	181
CITES	✓	✗	✓	✗	✓	1973	1975	169
MARPOL 73/78	✗	✓	✓	✗	✗	1973/78	1983	133 (c)
IMO (and PSSAs)	✗	✓	✓	✗	✗	✗	✗	(166)
Reg. Seas Prog.	(✓)	(✓)	(✓)	✓	✗	1974	✗	(140)
CMS	✓	(✓)	✓	(✓)	(✓)	1979	1983	95
LOSC	✓	(✓)	✓	(✓)	✗	1982	1994	149
BirdLife (IBAs)	(✓)	✓	✓	✗	(✓)	1989	✗	(130)
FCCC	✗	(✓)	(✓)	(✓)	(✓)	1992	1994	189
CBD	✓	✓	✓	✓	✓	1992	1993	188
Agenda 21	✓	✓	✓	✓	✓	1992	✗	(191)
FSA *(LOSC)*	(✓)	(✓)	(✓)	(✓)	✓	1995	2001	57
CCRF	(✓)	✓	✓	✓	✓	1995	✗	33 (d)
ACAP *(CMS)*	✓	(✓)	(✓)	(✓)	(✓)	2001	2004	8
Antarctic Instruments								
Antarctic Treaty	(✓)	(✓)	✓	(✓)	(✓)	1959	1961	45 (e)
CCAS	✓	✓	✓	(✓)	(✓)	1972	1978	16
CCAMLR	✓	✓	✓	✓	✓	1980	1982	32
Madrid Protocol	✓	✓	✓	✓	(✓)	1991	1998 (a)	31

✗ Does not meet criteria ✓ Directly meets criteria (✓) Indirectly meets criteria

(a) Annexes I to IV (Annex V entered into force separately in 2002 and Annex VI has not yet entered into force).
(b) Status refers to Contracting States (ie ratified, accepted, acceded or approved) as at March 2006. Brackets indicate voluntarily participation/membership (soft law).
(c) Refers to Annexes I and II. Annexes III to VI are each subject to separate ratification.
(d) Refers to Compliance Agreement which is part of CCRF.
(e) Refers to Contracting Parties, of which 28 have Consultative status.

Table 5.2 Species Conservation Measures in Selected International Instruments

Instrument or Approach	Species Protection Measures
Hard law instruments	
ICRW	Direct: Sustained Management Stock; Initial Management Stock; and Protected Stock (see Section III.10 of the Schedule). Indirect: Prevention of over-exploitation via gear specifications, catch/size limits, open/closed seasons, stock maintenance, restoration of target and dependent/associated species, controlling marine pollution.
MAB	Indirect: Sites may be nominated that contain landscapes/ecosystems/species in need of conservation. Biosphere Reserves must be managed to protect site values.
Ramsar	Indirect: Identify/protect sites that contain species of conservation concern (vulnerable, endangered, critically endangered species and communities) or important for biodiversity conservation (.e.g. breeding/spawning grounds, (birds and fish); sites that meet set thresholds of species/aggregations.
WHC	Indirect: Sites may be designated based upon their natural heritage, (e.g. geological values, threatened species, aesthetic or wilderness values or natural beauty).
CITES	Direct: Appendix I (endangered); Appendix II (at risk but not necessarily endangered); Appendix III (would benefit from cooperation/conservation).
CMS	Direct: Appendix I (endangered migratory species); Appendix II (migratory species with an unfavourable conservation status or that will substantially benefit from conservation). Indirect: Agreement on the Conservation of Albatrosses and Petrels covers 21 species address by-catch issues.
LOSC	Indirect: States Parties have a duty to conserve, manage, maintain and restore marine environment living resources (including high seas) whilst exercising their sovereign rights to exploit those resources (Article 193).
CBD	Direct: Identify/monitor key ecosystems/habitats, species/communities, genomes/genes; develop/maintain national legislation threatened species protection.
Antarctic Treaty CCAS CCAMLR Madrid Protocol	Direct: Protected Species (CCAS - Ross seal *Ommatophoca rossi*, Southern elephant seal *Mirounga leonina* and genus fur seal). Specially Protected Species (Madrid Protocol - Ross seal and fur seals). Protected species may be designated under CCAMLR. Indirect: Species size, age, sex, catch quotas, permit conditions, open/closed seasons, open/closed areas (breeding/spawning/nursery grounds) (CCAS, Madrid Protocol) Preserve relationships of dependent and related species via conservation measures (CCAMLR).
FSA	Indirect: The FSA encourages States Parties to create regional and/or subregional agreements for the conservation and management of straddling or highly migratory fish stocks, both within and beyond national jurisdiction.
Compliance Agreement (part of CCRF)	Indirect: Contracting Parties to the Compliance Agreement also agree to abide by the CCRF (see below). The Vessel Monitoring System was implemented under the Compliance Agreement. Compliance Agreement also asserts that whilst States have the right to fish on the high seas, that they also have a duty to take measures for the conservation and sustainable use of the marine living resources of the high seas.
Soft law instruments and alternative approaches	
RSA CCRF	Indirect: Permit conditions, catch size, age, sex, catch quotas, open/closed seasons, open/closed areas, by-catch mitigation, and the ecosystem approach.
Agenda 21, Chapter 17	Direct: Protect, maintain and restore ocean resources and ensure their sustainable use, both within and beyond national jurisdiction as outlined in the program areas. Indirect: States must work together for the effective management and conservation of fishery stocks, implement LOSC and ensure compliance by vessels flying their flags on the high seas.
IBA Program	Indirect: IBAs can be designated if they contain threatened species or species of conservation concern, restricted range/endemic species, or species congregations over specific thresholds.

Table 5.3 *In-situ* Conservation Measures in Selected International Instruments

Instrument or Approach	*In-situ* Protection Measures
Hard law Instruments	
ICRW	Direct: Whale sanctuaries (e.g. Southern Ocean), open/closed regions.
MAB	Direct: Parties must designate at least one Biosphere Reserve under national jurisdiction (that meets set criteria), comprising a core, buffer and transition zone. The "core zone" must be formally protected under national legislation.
Ramsar	Direct: List of Wetlands of International Importance (the List): Parties must designate at least one wetland (that meets set criteria) on the List and cooperate to protect transboundary sites. Sites on the List need not be formally protected. Parties should create nature reserves on wetlands and provide for conservation and wise use of all wetlands.
WHC	Direct: World Heritage List: Sites of outstanding universal value that meet set criteria (natural/cultural) may be nominated for protection on the List. Sites must have adequate long-term formal protection and have a buffer in the adjacent area to protect the values of the site by ensuring compatible land use.
MARPOL 73/78 and the IMO	Direct: Particularly Sensitive Sea Areas, Special Areas, Areas to be Avoided: areas where special measures exist to prevent/control marine pollution. The area south of 60° South is designated as a 'Special Area' (amongst others). Recently the IMO formulated a Convention to reduce alien species introductions called the International Convention for the Control and Management of Ships' Ballast Water and Sediments. It has not yet entered into force.
CMS	Indirect: States should conserve and manage migratory species and their habitats and to conclude legally binding agreements to that end, each with measures as deemed appropriate by signatory (Range) States (may include area protection).
LOSC	Indirect: Parties have duties to conserve and protect marine areas within and beyond national jurisdiction. This could include protected areas, although LOSC does reinforce that the high seas are subject to open access, and that the seabed is the common heritage of mankind.
FCCC	Indirect: Parties are obliged to take measures for the protection and enhancement of sinks and reservoirs of greenhouse gases – these could include marine areas within national jurisdiction.
CBD	Direct: Parties must create, monitor and manage a system of protected areas, including putting regulatory and management measures in place. They must provide guidelines for the selection of areas. The Jakarta Mandate compels Parties to develop a marine protected area network that provides high levels of protection both within and beyond national jurisdiction. Parties must control alien introductions.
Antarctic Treaty CCAS CCAMLR Madrid Protocol	Direct: Seal Reserves and Sealing Zones (CCAS); Madrid Protocol defines ASPAs and ASMAs. CCAMLR Ecosystem Monitoring Program (CEMP) sites; CCAMLR Conservation Measures apply to the CCAMLR Statistical Regions. Proposed ASPAs with a significant marine component must be approved by CCAMLR. Indirect: Madrid Protocol addresses alien introductions under Annex II.
FSA	Indirect: Encourages cooperation to protect fish stocks across their entire range.
Compliance Agreement (part of CCRF)	Indirect: Parties to the Compliance Agreement also agree to comply with CCRF (see below). Compliance Agreement also asserts that whilst States have the right to fish on the high seas, that they also have a duty to take measures for the conservation and sustainable use of the marine living resources of the high seas.
Soft law instruments and alternative approaches	
IBA Program	Indirect: Set criteria enable rigorous, quantitative identification of candidate IBAs that can be prioritised based upon the number and type of criteria they meet. BirdLife International advocate the formal protection of IBAs under national legislation but formal protection is not essential.
Agenda 21	Direct: Protected Areas are designated for conservation and sustainable use of biodiversity and/or to avoid marine degradation. Parties should adopt preventative, anticipatory and precautionary approaches to the marine environment and its protection.
RSA CCRF	Indirect: RSA encourages Parties to conclude agreements in shared areas for their conservation and wise use. CCRF Parties should apply the precautionary approach, and protect critical fisheries habitats. There are provisions for open/closed areas.

The ATS provides an adequate framework for Antarctic marine conservation. The Antarctic Treaty itself is the foundation of the ATS, which has evolved to incorporate three key instruments that govern human activities in the Antarctic: CCAS, CCAMLR and the Madrid Protocol. Species, *in-situ* and *ex-situ* conservation measures all form part of each instrument of the ATS. Species protection is primarily implemented under Annex II of the Madrid Protocol, and is subject to regulation via permits that specify permissible, restricted or prohibited activities, with SPS subject to stricter measures. CCAS and CCAMLR also impose species based management measures. *In-situ* measures are predominantly set via Annex V of the Madrid Protocol, with the designation of ASPAs and ASMAs to manage human activities in important or vulnerable areas. There are additional area protection classifications available in CCAS (Seal Reserves, Sealing Zones) and CCAMLR (CEMP sites, CCAMLR Statistical Regions/subregions). Measures for *ex-situ* conservation are found in all the instruments of the ATS and cover, *inter alia*, scientific cooperation and research, education and training, control of alien introductions, conditions for EIA, and regulations on marine pollution, waste management and disposal. The recent conclusion of Annex VI of the Madrid Protocol on liability represented a critical step in legal obligations to protected the Antarctic region, which is arguably amongst the most comprehensively protected and managed regions of the world under the instruments of the ATS.

CCAMLR's role in the protection of the Southern Ocean is pivotal in the operation of the ATS and should be an integral part of any marine conservation strategy in the Antarctic. CCAMLR adopts a definition of conservation that includes rational (sustainable) use rather than no use, and incorporates measures for species, *in-situ* and *ex-situ* conservation in the Southern Ocean. CCAMLR provides an early example of the adoption of the ecosystem approach to fisheries management, and recognises the need to adopt a precautionary approach. CCAMLR regulates and restricts activities in the Southern Ocean by the implementation of numerous conservation measures that apply within the CCAMLR region, which broadly follows the Polar Frontal Zone and considers impacts on dependent and associated species (hence the ecosystem approach). CCAMLR takes the ecosystem approach a step further, incorporating an obligation to consider and take measures not only to conserve target species, but also to conserve dependent and associated species, marking a significant shift in conservation planning in the region and the world.

The CCAMLR Commission's adaptive management is an important component of their pioneering approach to fisheries management. The conservation measures put in place by the CCAMLR Commission are informed by best current scientific knowledge available, and these measures are subject to annual review informed by updated scientific knowledge and understanding of the marine environment. The CCAMLR Commission emphasises that the lack of full scientific knowledge should not prevent conservation action. The CCAMLR Commission also sets by-catch trigger points that inform fisheries to move on once a trigger level of by-catch has been reached (Constable et al. 2000). The CCAMLR Commission recognises that reactive management to fisheries impacts was an inadequate means by which to manage stocks in the long term, and sets precautionary catch limits that account for natural variability, consider recruitment and predation, and ensure that stocks aren't exploited below levels that ensure maximum sustainable yield (Constable et al. 2000, Constable 2001). Catch limits also take into account the high levels of IUU fishing.

The CCAMLR Commission held a MPA workshop in 2005 to discuss the development and implementation of a Southern Ocean MPA system. With the Southern Ocean bioregionalisation currently underway, the CCAMLR Commission has recognised that a need may exist to create pilot MPAs in the Southern Ocean. An area of difficulty that it faces is that first and foremost CCAMLR is a fisheries management tool, and the need to protect ocean resources must be balanced with the need to facilitate sustainable use of those resources.

CCAS has been extremely effective in facilitating the recovery of Antarctic seal stocks that had been subject to heavy exploitation in the 19th and 20th century, demonstrated by the fact that all seal species occurring in the Antarctic are classified as IUCN lower risk conservation status (ATCM XXVII / IP88 2004). However, there are only 16 Contracting Parties to CCAS, hence the reach and ability of CCAS to influence human activities is limited only to those Contracting Parties, or operations flagged by those States. Notwithstanding, there has not been any discussion of a recommencement of sealing operations in the Antarctic within the context of the ATS. As described earlier, CCAS does not address dependent and associated species, however SCAR has responsibility for monitoring sealing activities, and reporting when activities have had a detrimental impact on seal stocks or ecosystem balance, or if permissible catch limits

have been reached (Article 5). These provisions indicate a somewhat precautionary approach and ecosystem considerations, although not explicitly so. It should be noted, however, that CCAS was implemented when seals were at the point of extinction, so a pure precautionary approach would have sought to prevent this well before such threats were evident. CCAS does not address interactions with other international instruments, or even with the instruments of the ATS. For example, LOSC asserts freedom of access to the high seas, whereas CCAS outlines permissible sealing activities within Seal Zones, and prevents access to Sealing Reserves. This is area of ambiguity for States that are signatories to both LOSC and CCAS. Of course, States that have not signed one or both of the Conventions are not obliged to comply with the conservation measures of either instrument, except perhaps if interpreted as customary law or if flying the flag of a Contracting Party. CCAS does not protect seals on the ice or land (unless within a Seal Reserve), which is a major flaw in the Convention. A recent decision to de-list fur seals as SPS means that only Ross Seals are protected under Annex II of the Madrid Protocol as SPS (ATCM XXVIII / WP33 2005). CCAS could be improved by endorsing the ecosystem approach and incorporating measures for the conservation of dependent and associated species in the Annex. CCAS could also apply the precautionary approach, and in particular, where the biology, distribution and abundance of seal species is poorly understood (such as with Crabeater Seals), a precautionary approach to their management should be applied.

The ATS does not address whale conservation, instead leaving the conservation and sustainable use of whale populations to the ICRW (and the IWC) and more broadly to LOSC. The efficacy of whale sanctuaries under the ICRW has been questioned by some commentators, and there have been proposals to amend the Convention and/or implement a Revised Management Scheme or Revised Management Procedure to impose quotas on whaling for scientific purposes (Gerber et al. 2005). As yet proposals for such changes have not been well received by Contracting Parties. The ICRW therefore does not provide the ATS with any valuable approaches for high seas marine conservation. Should the ICRW be superseded, the ATCPs should consider involvement in any negotiations for a replacement instrument and/or extend the coverage of the ATS to apply to whales in the Southern Ocean and/or beyond.

The absence of any explicit measures for the conservation of whales in the Antarctic under the ATS is a flaw in the Antarctic conservation regime, since whales are top predators and their exploitation or conservation could, and quite possibly has, resulted in changes in ecosystem structure and function. Furthermore, the fact that the CCAMLR definition of marine living resources (Article 1.2) excludes both seals and whales is a matter of some concern. Whales and the ATS have recently been the subject of discussions at SCAR meetings (Dolman 2005) but as yet the Contracting Parties continue to hold the view that whale conservation is the ambit of the IWC. Despite this, the CCAMLR Commission should consider whales in the development of its conservation measures, given the importance of cetaceans in the Southern Ocean ecosystem and providing that any such measures do not derogate from the rights and obligations of Contracting Parties to the ICRW and LOSC generally. In the present climate, it appears highly unlikely that the CCAMLR Commission will change its mandate to include whales, particularly due to the need for consensus decision-making of the Commission and the contentious nature of whaling issues. However, under Article 13.3 of CCAMLR there is a provision to develop cooperative relationships with the IWC, so CCAMLR could still pursue the issue of whales should it choose to. CCAMLR has already made progress in this regard, inviting the IWC (amongst other international organisations) to attend CCAMLR Commission meetings and contribute to discussions on items of mutual interest (CCAMLR Commission 2005b, para's 15.1 to 15.31).

The instruments of the ATS form a solid foundation for high seas, Southern Ocean protection. With the exception of whales, the ATS provides comprehensive measures for species, *in-situ* and *ex-situ* conservation. ATCPs could improve conservation outcomes by more effective implementation of measures (Grant 2005), in particular the development and adoption of a systematic approach to species and *in-situ* conservation, which have in some areas been lacking (ATCM XXVIII / WP11 2005). In particular, the Antarctic protected area system has developed in an *ad hoc* way and MPAs are severely under-represented, with the majority of Antarctic MPAs tacked on to terrestrial ASPAs[8].

[8] In March 2006 the only two solely marine ASPAs (ASPAs 152 and 153) were designated in 1991 under Annex V of the Madrid Protocol (see http://www.cep.aq/apa/index.html, cited September 2006).

5.3.2 International Instruments and Approaches for High Seas Conservation

It may be feasible to consider international approaches that are not within the ATS, but that may complement the ATS and assist Treaty Parties in implementing their conservation obligations. Many hard law instruments in force today were initially soft law (codes of conduct, guidelines), such as the Agreed Measures, CCAS and CCAMLR. Therefore, the power of soft law should not be under-estimated. It provides a platform upon which States can begin to take conservation action or indicate their support in principle, without fear of legal ramifications. Once in place, soft law is substantially easier to subsequently codify and gain support for in the form of a hard law instrument than attempts to create a completely new, legally binding agreement.

It is important to consider how international instruments may apply to the oceans and high seas – arguably areas outside national jurisdiction for which the world community of States take responsibility. The provisions of international environmental instruments generally apply within national jurisdiction or via flag state responsibility. The status of an instrument can be an important measure of its ability to impact on conservation outcomes on a global scale. For example, an instrument that has widespread support such as the CBD with 188 signatories is likely to have a greater impact than one with fewer signatories, such as the Compliance Agreement with just 33 Contracting Parties (as at March 2006).

The application of measures on the high seas can be difficult, however States signatories can enforce measures on their nationals irrespective of their location if they so choose. Some instruments, such as LOSC, actually stipulate that Contracting Parties must fulfil certain obligations on the high seas. In other words, if their nationals act in contravention of the rules and regulations set by their government to meet their obligations under international law, they can be prosecuted by their government irrespective of where they were conducting those activities. Of course, since each State is responsible for implementing their own national legislation to fulfil their obligations under international law, this is subject to interpretation and methods of monitoring and enforcement can vary.

Effective implementation, monitoring and enforcement of international environmental law poses a challenge for policy-makers and managers, and can be complex and costly in

the marine environment, particularly in the high seas and the Antarctic (Myers and Worm 2003). MPAs have been met with resistance from some fisheries sectors that view protection as a threat to their livelihoods, and there have been various positive and negative outcomes from marine reserves (closures) (see Salomon 2004 for case studies).

Furthermore, where a third-party State is involved in contentious activities regulated by international law, accountability can be difficult since they have not committed to the measures set forth in international law (Myers and Worm 2003, McClanahan and Graham 2005). This is particularly relevant in the high seas since many States view any regulation of the high seas as a threat to their traditional freedom of access – believing, incorrectly, that they have a right (as set forth in LOSC) to fish international waters without constraint. However, if a vessel has been seen engaged in IUU fishing within the jurisdiction of another State, then that State (if a Party to LOSC) has the right to uninterrupted hot pursuit, such as was the case with Australia's chase of the vessels *South Tomi* and *Viarsa 1*, which was supported by other States Signatories to LOSC (Molenaar 2004a). Reflagging, or flags of convenience complicate this further. Some of these challenges are already being addressed by agreements and organisations, for example the CCAMLR Commission has been lobbying problem-States regarding prevention of reflagging.

The fact that Contracting States can (and do) have the power to control the activities of their nationals irrespective of location can add weight to the effectiveness of international environmental law. Similarly, States can choose to implement measures that are more rigorous or strict than those required under LOSC or other conventions. This is subject to political will and effective monitoring and enforcement programs, but it can and has been done. The Australian Government has done just this. For example, the Australian government stipulates that any Parties licensed to fish by the Australian authorities (including those that commence fishing activity within the Australian EEZ but that move outside the EEZ into international waters) must comply with set conditions irrespective of location, including reporting on catch effort, and being subject to inspection and observation (Bergin and Haward 1995). Furthermore, the Australian Government imposes stricter measures than those required by CCAMLR around their EEZ surrounding Heard Island and McDonald Islands. Vessels must have a permit from the Australian Government and the CCAMLR Commission to have the

right to fish in the region (Molenaar 2004a). These are good examples of a State using their powers of jurisdiction to influence and manage high seas activities, and such an approach could be adopted elsewhere by influential States, providing they had sufficient political will to take such steps.

One of the greatest factors influencing effectiveness of international law is that of political will. States have shown a capacity for international cooperation for a mutually desirable conservation outcome in their formulation of agreements such as CMS, the RSAs and the CCRF (Gjerde 2001). The first ever MPA with a high seas component was designated in 2002 in the Mediterranean Sea after years of negotiations between France, Italy and Monaco. Negotiations for the joint MPA took place due to mutual concerns over pollution, collisions, and fishing and disturbance of the seas which were discovered to be rich in marine mammal species (Sciara 2003). Further examples of the growing cooperation between interested States can be seen with the increasing number of transboundary reserves (Zbicz 2001), the work of the CBD Secretariat to build on transboundary area protection (CBD Secretariat 2004), and the development of agreements such as the FSA covering highly migratory species. However, it is common for economic benefits to be put ahead of conservation objectives, and many States have perverse economic incentives in place that impede positive conservation outcomes and perpetuate issues such as fisheries over-capitalisation and over-exploitation (Vidas 2000). Most conventions allow amendments and additions to be made to the text (including annexes/appendices) and hence can be adaptive in their approach, but reaching agreement on any such amendments can be problematic and many instruments, such as the ICRW and CMS allow for reservations which weakens their effectiveness.

The contentious nature of Antarctic sovereignty calls for extreme caution when considering how international instruments and approaches may apply in the Antarctic. Nonetheless, it is important for Contracting Parties to be aware of, and operate consistently with, international environmental best practice. The issue of territorial claims in the Antarctic has already been discussed, and the 'agreement to disagree' is still effective today. There are seven claimant States, each maintaining their claim to Antarctic territory. Hypothetically speaking, then, claimant States have the right to declare an EEZ around their Antarctic territory within set timeframes, as Australia has

done (Green 2001). Furthermore, they can (since they believe their Antarctic claim to be authentic) implement associated measures in the Antarctic region as required by international law and applicable to areas under their national jurisdiction. Such measures would only apply to their nationals, such as Australia's extended continental shelf claim in the Antarctic (Jabour 2006a).

The exercise of flag State jurisdiction in areas beyond national waters could apply to one or more international agreements, such as creating a Biosphere Reserve under the MAB Program; a Ramsar site; or signatories to the WHC could apply to designate a site for listing in the WHC. Such a proposal may not, however, be recognised by third-Party States, the ATS or in fact the international community at all. Furthermore, such actions could potentially lead to severe conflict and destabilise the ATS. This is particularly true for those States with an interest in extraction of resources in the region either now or in the foreseeable future. Therefore, any such actions would have to proceed with extreme caution so as not to undermine the successful operation of the ATS.

Alternatively, under some agreements, such as the WHC and Ramsar, Contracting Parties have a duty to cooperate in areas of mutual interest, such as the high seas, to propose sites of global significance for protection. Interested States involved in the ATS and other conventions and international organisations could collaborate regarding areas of shared interest and reach mutually compatible and realistic goals and agreements. The consideration of alternative international instruments does not necessarily imply their direct application in the Antarctic (e.g. the designation of world heritage sites), it may simply be relevant to guide and inform ATCPs in their decision-making process and the formulation of new and ongoing measures for environmental protection in the Antarctic.

The adoption of emerging environmental principles such as the precautionary principle and ecosystem approach into international law has not been universal. Many international instruments, such as the ICRW, pre-date such approaches so may contain measures or objectives that do not represent current conservation thinking. CCAMLR was one of the first agreements to attempt to implement the ecosystem approach, incorporating precautionary catch limits and gear specifications from the outset. However, CCAMLR has taken the best part of 20 years to achieve its objective and it

still faces criticism although it continues to incorporate adaptive management and new measures in its approach. More recently, the CBD, FSA and Agenda 21 have each endorsed the precautionary principle and ecosystem approach as essential parts of conservation planning and implementation.

The prospect of creating a new international environmental instrument that applies to the high seas has been discussed as an option at MPA workshops (Gjerde 2003, Gjerde and Breide 2003, CCAMLR Commission 2005a). Interested organisations and States could develop a new instrument and measures for the conservation and sustainable use of high seas marine living resources. However, the creation of a new environmental instrument is unnecessary at this time. New instruments can take years to negotiate and finalise and even longer to enter into force, and adoption can be slow (for example, LOSC negotiations took over 20 years from preparatory conference to ratification). Furthermore, to add to the many obligations that States have under international law would produce further confusion and inconsistencies. Action for improved marine conservation is required now and should be done within the context of existing environmental law, whether at an international or regional level (Gjerde 2001, 2003).

5.4 A Way Forward: Possible Frameworks for Action

The application of key international instruments and approaches for high seas conservation has been considered in this study. Instruments that offer the most comprehensive protection measures, incorporating species, *in-situ* and *ex-situ* conservation, and the precautionary and ecosystem approach, will have the most enduring impacts on conservation and sustainable use of the world's resources. In addition to the continued operation of the ATS, there are three key approaches to the application of international law that can be taken:

1. Adopt and endorse instruments that specifically address the high seas.
2. Apply the criteria or approaches used in international instruments but do not adopts them within the Antarctic region.
3. Develop cooperative relationships with relevant bodies and organisations.

5.4.1 Instruments that Address the High Seas

LOSC and the CBD have the greatest potential to be applied for high seas marine conservation. Both instruments promote the conservation and sustainable use of high

seas marine living resources, and can influence activities on the high seas primarily through flag State jurisdiction. The widespread adoption of LOSC and CBD also indicate their capacity to influence activities and to develop conservation initiatives that invoke a sense of environmental stewardship on a global scale. LOSC declared the seabed and subsoil to be the common heritage of mankind to be managed by the ISA. The high seas, areas beyond 200 nautical miles from the low water mark, are subject to a qualified freedom of access, and LOSC does impose a duty on Contracting Parties for the conservation and sustainable use of high seas marine living resources. In fact, Articles 61, 193 and 194 impose duties on States not only for the conservation and management of high seas marine living resources, but also to restore stocks of both target and dependent species. Contracting Parties must also cooperate with other States and organisations regarding conservation of migratory species within and beyond national jurisdiction, and protect (high seas) marine mammals (Articles 62, 65 and 120). These obligations leave little room for ambiguity relating to implementation of conservation measures on the high seas. The FSA, an implementing agreement of LOSC, applies to transboundary and migratory fish stocks. The FSA strongly advocates the precautionary and ecosystem approach, and applies to migratory species across their entire range, irrespective of jurisdiction. Article 5 of the CBD imposes a duty on Contracting Parties for the conservation and sustainable use of resources in areas outside national jurisdiction or in areas of common interest. Furthermore, the Jakarta Mandate and various decisions taken at the CBD COP reiterate the need to develop protected area networks within and beyond national jurisdiction. The CBD strongly advocates the adoption of the precautionary and ecosystem approaches, and provides comprehensive measures and guidelines for species, *in-situ* and *ex-situ* conservation.

CMS (including ACAP), Ramsar and CITES are instruments that take a predominantly species-based approach to conservation, although CMS and Ramsar both have provisions for area designation and/or protection. Ramsar does not impose a legal obligation on Contracting Parties to protect sites on the List, which undermines its effectiveness. Despite this, the CMS and Ramsar take an ecosystem approach as each aims to protect species across their range and at critical stages in their life-cycle. Furthermore, Ramsar considers dependent and associated species in site identification and designation. CMS, although not as widely adopted as Ramsar or CITES, aims to protect species across their range and can impact on conservation outcomes of

vulnerable species via implementing agreements. The application of Ramsar in the Antarctic and subantarctic has been considered, and in fact, since Ramsar sites do not have to formally be protected, the application of Ramsar in the Antarctic may actually be easier to integrate within the ATS framework than other approaches that may contradict the instruments or measures of the ATS. CITES could have potential to impact on high seas conservation outcomes since it applies trade restrictions to listed species irrespective of their location. However, without area protection and endorsement of the ecosystem approach, CITES can really only supplement other agreements effective on the high seas. The listing of Patagonian toothfish on CITES has been discussed but not implemented purely for political reasons that are of no relevance to species protection (Molenaar 2004a). ACAP, an implementing agreement of CMS also applies to many vulnerable species that breed and forage in the Antarctic, yet without significant effort directed at stopping IUU fishing, to which the albatross and petrel species are most vulnerable, the Agreement is largely useless.

5.4.2 The Application of International Criteria or Approaches within the ATS

The WHC and MAB Program are both instruments whose application in the Antarctic has been explored. Each has scientifically rigorous, internationally recognised criteria for site selection and sites must be formally protected under State law. Hence, their application in the Antarctic is somewhat dubious considering the frozen nature of Antarctic territorial claims. The ATS could more readily adopt similar functions and criteria as the Biosphere Reserves, for example, to aid in site selection and demonstrate to the global community the efforts of the ATS to accommodate multiple use, conservation and sustainable use. The concept behind MAB is scientific research and monitoring, a principal and motivating factor of the ATS, so the application of the MAB concept in the Antarctic is consistent with the objectives of the ATS. Alternatively, ATCPs could decide to designate Biosphere Reserves in the Antarctic with the knowledge that any such designation is pragmatic and does accommodate conservation and sustainable use. But this option, whilst not necessarily threatening to current activities and interests in the Antarctic, is not ideal, as it would once again complicate the protected area system and could lead to confusion in site management.

BirdLife can assist the ATS in the identification of sites of high conservation value for birds as part of their IBA Program. Bird biodiversity appears to correspond with general species biodiversity, so conservation benefits often extend beyond bird populations to

other species. Also, as IBAs do not have to be formally protected under State law, the application of IBA criteria in the Antarctic could inform the decision-making process without posing a threat to the operation of the ATS; much like Ramsar. BirdLife is already undertaking an Antarctic IBA Program for the Continent, hence the current work BirdLife is doing on the MPA program will add further value in the Antarctic and since the concept is already being endorsed by SCAR it is an approach more likely to be met with acceptance from ATCPs and/or the CCAMLR Commission.

5.4.3 Lobbying and Cooperation

Voluntary agreements and international organisations, including RFMOs, also have potential to impact on conservation outcomes for the Southern Ocean. Organisations such as the IUCN, FAO, UN (through their agencies such as UNEP, the World Conservation Monitoring Centre (WCMC) or WCPA) and the IMO have far reaching influence in the global community and could play a key role in developing and assisting States to implement international agreements. It is more likely that this would work better at a State level than at the formal ATCM level as Treaty Parties are known to eschew UN involvement in Antarctic affairs and regularly display their desire to retain exclusive competence over all things Antarctic (Beck 1986, Grant 2005, Jabour 2006b). The IMO experience with the draft polar code further emphasises this point (Scovazzi 2000).

A problem with international, regional and subregional instruments covering the marine environment is that the protective measures generally apply only within national jurisdiction or a discrete area, or via flag State jurisdiction, which can be subject to varying interpretation. In the case of species or area protection, once the target resource leaves that region, there may be no protective measures in place, and this could undermine the operation and success of such measures. For example, the CCAMLR Commission sets numerous measures for the conservation of Antarctic marine living resources that apply only within the CCAMLR Region. The CCAMLR Commission should cooperate with adjacent States to develop an agreement that would extend the protection of these critical resources across their entire range, including dependent and associated species, a provision for species, *in-situ* or *ex-situ* protection as deemed appropriate. The CCAMLR text actually obligates Contracting Parties to cooperate with adjacent States in support of the protective measures within the Convention, and efforts in this regard would be enhanced by greater dialogue and collaboration. The success of

any international or regional instrument is impacted by the political will of Contracting Parties, and each State's own commitment and effective implementation of relevant measures. Some environmental problems, particularly relating to an area as large and diverse as the high seas, are much greater than one State alone can manage and collaboration is an essential component of any successful strategy.

UNEPs Regional Seas Program need not be applied to the Southern Ocean since it is already governed by the CCAMLR Commission, the competent FMO for the region. However the CCAMLR Commission should continue to collaborate with UNEP to ensure that the measures adopted are consistent with international environmental conservation standards such as those implemented within various RSAs. The CCAMLR Commission could even consider the option of reaching agreement with UNEP to formally recognise CCAMLR as a RSA in its own right. However, any such attempt should be undertaken with caution, be transparent, ensure that all stakeholders are consulted and proceed without any changes to the name, formal measures or operation of CCAMLR.

5.5 Summary

This chapter has considered how the ATS and alternative international approaches and instruments may be applied to promote the conservation and sustainable use in the Antarctic. The next challenge is how to identify key areas for priority protection in the Southern Ocean. The seabirds at sea case study in the next chapter considers the application of seabirds as surrogates for marine biodiversity in the Southern Ocean, and provides some indication of priority areas that may be a useful starting point for developing an MPA network in the Southern Ocean. Finally, the interaction between the ATS and alternative instruments and approaches, and the outcomes to the case study are drawn together and conclusions and recommendations are made in Chapter 7.

6 CASE STUDY: SEABIRDS AS SURROGATES FOR MARINE BIODIVERSITY IN THE SOUTHERN OCEAN

A major issue facing decision-makers regarding the conservation of marine living resources is the current paucity of biological data on the marine environment. Data coverage is patchy and unrepresentative in both time and space, and in terms of species coverage. Although the oceans cover 70% of the earth's surface (Dallmeyer 2003), of which 50% is high seas component (Gjerde and Breide 2003), global knowledge of the species inhabiting the marine environment is insufficient, and some estimates suggest that around half a million species are yet to be discovered (Kimball 2001). The questions remains, then, how do we select areas for conservation action in the absence of full scientific knowledge?

This case study[1] considers the application of at sea seabird sightings (henceforth referred to as seabird sightings) to act as proxies or surrogates for marine biodiversity, and to assist in the identification and selection of priority areas for management action in the Southern Ocean. At sea distribution of birds is dependent upon the availability of adequate prey. Prey availability is a product of geographical distribution, abundance and accessibility of appropriate prey species, which is in turn influenced by oceanographic factors including ice cover, turbidity and physical processes (e.g. Hunt 1991). In the Antarctic, seabird breeding distributions are largely constrained due to the limited amount of ice-free areas suitable for breeding purposes (Hunt 1991). Seabird sightings have value for conservation planning as they are conspicuous, easily identified, and areas rich in seabird species have been found to also be rich in other species (Pritchard et al. 1992, Barnes 1998, Brooks et al. 2001, Garson et al. 2002, Margules et al. 2002).

6.1 Survey Effort

In most cases, surveys of Wildlife on Voyage were made during resupply voyages to Australia's Antarctic stations. Some surveys were undertaken on dedicated marine research voyages. Accordingly, survey effort and sightings are concentrated along favoured ship tracks. Figure 6.1 shows survey effort by 1° x 1°, 2° x 2° and 5° x 5° bins

[1] Preliminary results of this case study have been presented elsewhere, as oral and poster presentations (Harris et al. 2005a, 2005b, 2005c).

(henceforth referred to as 1 degree, 2 degree and 5 degree bins), with the corresponding values for low, medium and high displayed in Table 6.1. For example, for the 1 degree bins, if a single grid cell was surveyed five times, it was classed as 'Low' and shaded pink, for values between 6 and 15, the classing set was 'Medium', and any values over 15 was classed as 'High'. Ship tracks are clearly visible at each spatial scale, with clusters of high survey effort appearing around Australia's permanent Antarctic stations at Macquarie Island, Casey, Davis and Mawson. Concentrations are also visible around Heard Island and McDonald Islands (Australia), Iles Kerguelen and Dumont d'Urville (France). These results are as would be expected since the majority of seabird sightings are taken *en route* to and from Antarctic stations, with fewer records from marine science voyages.

Table 6.1 Survey Effort Classing Sets (Low, Medium, High)

	No. of Surveys per bin		
	1 Degree bins	2 Degree bins	5 Degree bins
Low (pink)	1 to 5	1 to 15	1 to 50
Medium (red)	5 to 15	15 to 50	50 to 250
High (maroon)	15+	50+	250+

As described in Chapter 4, the effects of survey effort (and bin size) were removed to produce standardised maps of the four surrogates examined in this study. The Mantel statistic was used to determine whether any relationship exists between location and each surrogate. A very weak positive correlation was evident in each of the surrogates, indicating that there is little evidence of a relationship between location and each of the four surrogates. However, spatial patterns may exist at the surrogate level independent of latitude and longitude.

6.2 Surrogate Measures

Analyses of species density, species richness, IUCN status and Shannon-Weaver Diversity Index results follow. All surrogate values were expressed as the value of the surrogate per survey per km^2. The analyses were completed at the 1 degree, 2 degree and 5 degree bin scales. At the 1 degree bin scale, bin number 25,971 (see Table 6.4, which is discussed in Section 6.5) recorded four observations of light mantled sooty albatross; four white chinned petrels and two Wilson's storm petrels. Therefore, the raw species density measure is 10, species richness (i.e. number of different species) is three, IUCN status is four, and the value for the Shannon-Weaver Diversity Index is 1.55.

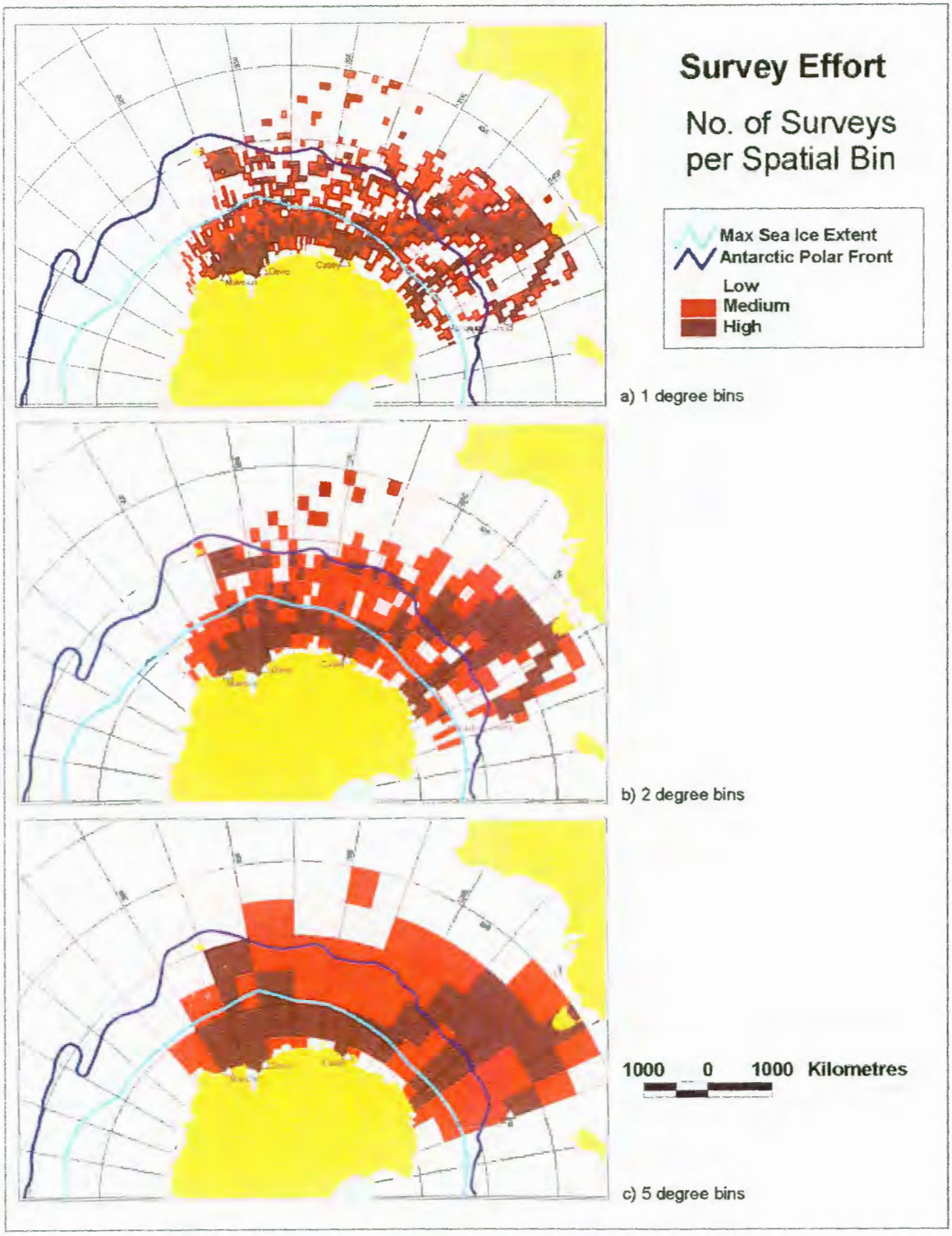


Figure 6.1 Survey Effort

Survey density (number of surveys) at 1° x 1°, 2° x 2° and 5° x 5° latitude by longitude, classified as low (pink), medium (red) and high (maroon) for the Indian Ocean for the period 1977-78 to 2001-02. The pale blue line indicates the maximum sea-ice extent and the dark blue line indicates the location of the Antarctic Polar Front.

The cell was surveyed twice, so the surrogate per survey (surrogate / surveys) measures are five (density), 1.5 (richness), two (IUCN) and 0.77 (Shannon-Weaver Diversity Index). Each surrogate measure was divided by the area (km^2), which for bin 25,971 was 6,275km^2, and normalised to between 0 and 1. The final, adjusted values of the surrogates were 0.22 (density), 0.19 (richness), 0.43 (IUCN) and 0.27 (Shannon-Weaver Diversity Index). Each surrogate was classed into one of three classing sets: low (pink), medium (red) and high (maroon) and subsequently mapped. The classing set data ranges are displayed in Table 6.2. So, for density, any values that were under 0.097 were classed 'Low'' for the 1 degree bins; values between 0.097 and 0.155 were classed 'Medium' and values over 0.155 were classified as 'High'. This analysis was repeated for each bin size and surrogate.

Table 6.2 Surrogate Classing Sets

	Surrogate per survey per km^2			
	Density	**Richness**	**IUCN**	**Shannon-Weaver**
1 degree bins				
Low (pink)	0 to 0.097	0 to 0.071	0 to 0.061	0 to 0.050
Medium (red)	0.097 to 0.155	0.071 to 0.137	0.061 to 0.199	0.050 to 0.128
High (maroon)	0.155 to 1	0.137 to 1	0.199 to 1	0.128 to 1
2 degree bins				
Low (pink)	0 to 0.175	0 to 0.052	0 to 0.087	0 to 0.028
Medium (red)	0.175 to 0.256	0.052 to 0.107	0.087 to 0.217	0.028 to 0.074
High (maroon)	0.256 to 1	0.107 to 1	0.217 to 1	0.074 to 1
5 degree bins				
Low (pink)	0 to 0.150	0 to 0.023	0 to 0.175	0 to 0.009
Medium (red)	0.150 to 0.259	0.023 to 0.064	0.175 to 0.422	0.009 to 0.033
High (maroon)	0.259 to 1	0.064 to 1	0.422 to 1	0.033 to 1

As bin size increases (from 1 degree to 5 degree) it is easier to detect spatial patterns or clustering of like values. The areas of greatest interest for potential conservation action are those classed 'High' (mapped with maroon). Although the 5 degree bins often display strong clustering, interpretation of these maps must be undertaken with caution since the effect(s) of averaging the observations at this scale may overstate (or understate) actual densities. For example, for the region bounded by 40° - 50° E longitude and 40° - 50° S latitude, there were only four cells where observations were recorded at the 1 degree scale. At the 1 degree scale, the small number and extent of

observations in this region is abundantly clear, however at the 5 degree scale the entire region is classed as high (mapped maroon) for all four surrogates. Removing the effects of the number of surveys will have little impact for this region as the number of surveys was low, hence the averaging effect on the cells, which results in high average values.

6.2.1 Species Density

Species density (for seabirds) in the Indian sector of the Southern Ocean is illustrated in Figure 6.2, with corresponding data values in Table 6.2. The regions that appear to be characterised by high values, thus displaying the highest species densities, are around Mawson and Davis (Prydz Bay). Areas surrounding subantarctic islands also tend to exhibit high concentrations, in particular Heard Island and McDonald Islands, and Iles Kerguelen. In contrast, the region around Macquarie Island exhibits medium-high densities. These patterns are most likely due to proximity to breeding sites on these subantarctic islands.

6.2.2 Species Richness

The distribution of seabird species richness is illustrated in Figure 6.3, and exhibits less spatial clustering than species density. The data values for the classes of low, medium and high are given in Table 6.2. Species richness tends from medium to high in the regions around the Antarctic Polar Front. There is some clustering of high (and medium) areas south-west of Iles Kerguelen, Heard Island and McDonald Islands, which may be associated with access to breeding sites on subantarctic islands and foraging areas associated with the continental shelf break or Kerguelen Plateau. Generally, species richness appears to be lower closer to the Antarctic continent, indicating a greater likelihood of species aggregations (Woehler et al. 2003), not congregations, south of the maximum sea-ice extent. A large cluster of low values also appears south-west of Tasmania. A degree of clustering of medium values for species richness is apparent around and north of the maximum average sea-ice extent, indicating that species richness is likely to be greater in areas where there is access to open water. It is interesting to note that the region directly surrounding Heard Island and McDonald Islands is characterised by low species richness.

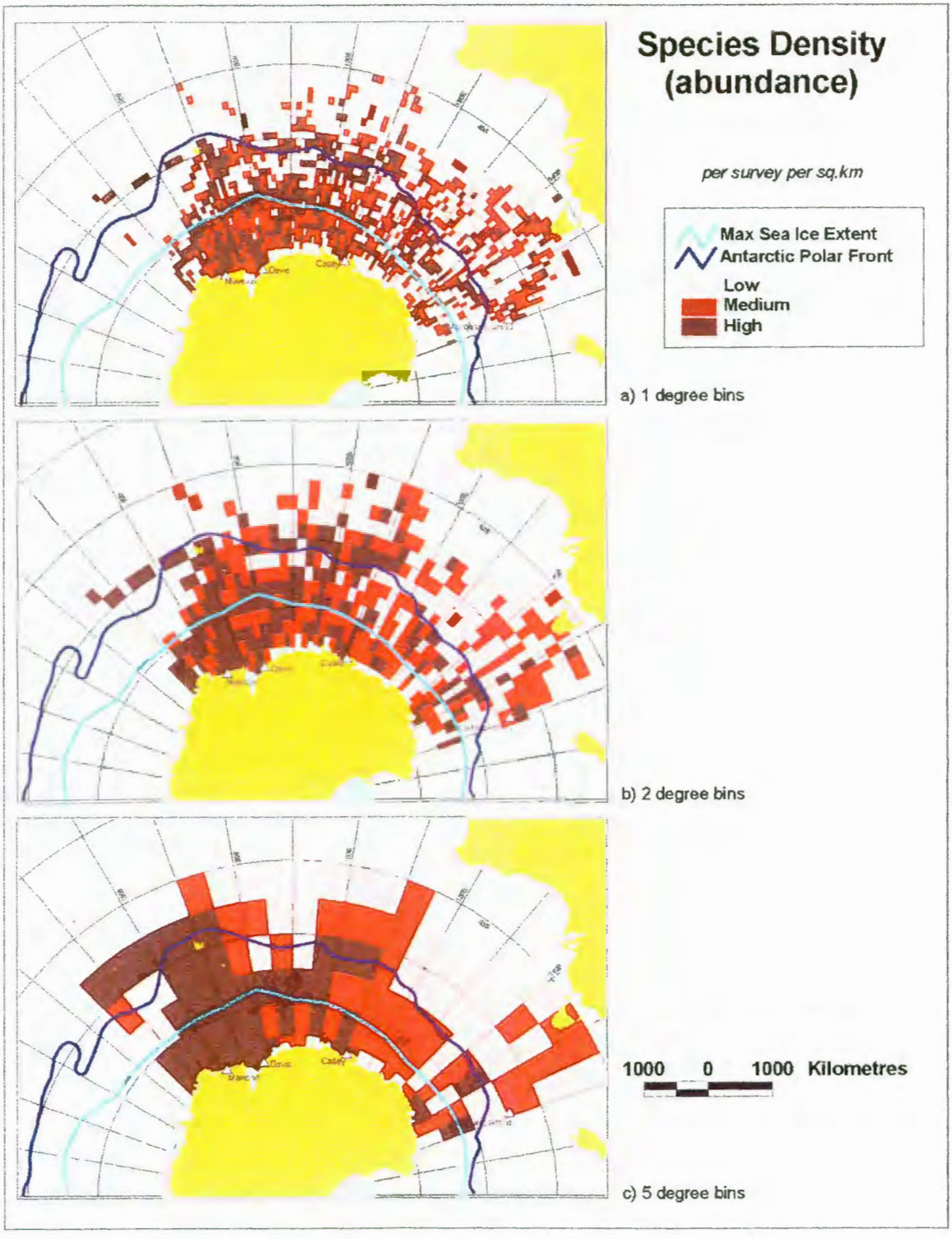


Figure 6.2 Species Density

Species density (number of birds/km²/survey) at 1° x 1°, 2° x 2° and 5° x 5° latitude by longitude, classified as low (pink), medium (red) and high (maroon) for the Indian Ocean for the period 1977-78 to 2001-02. The pale blue line indicates the maximum sea-ice extent and the dark blue line indicates the location of the Antarctic Polar Front.

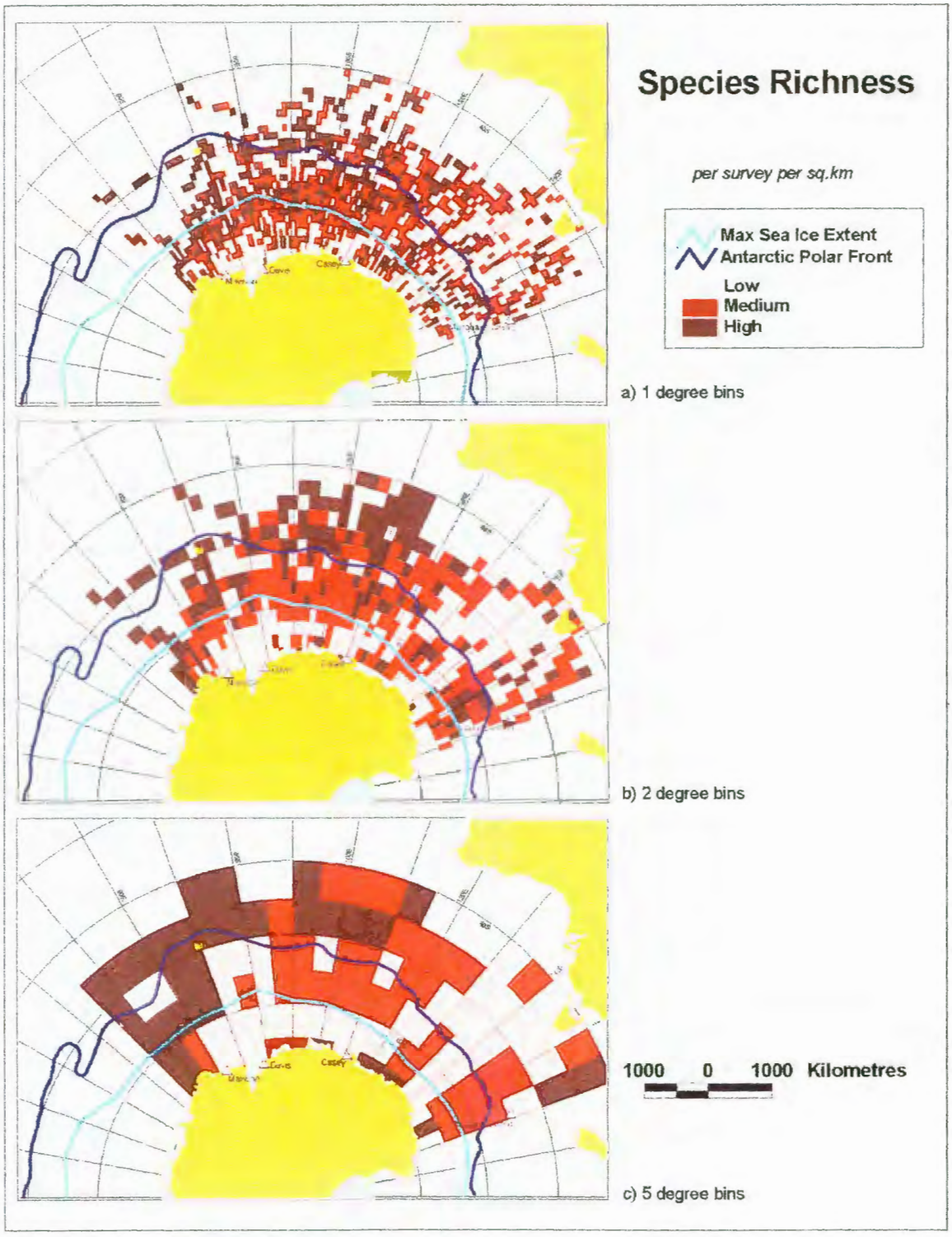


Figure 6.3 Species Richness

Species richness (number of bird species/km²/survey) at 1° x 1°, 2° x 2° and 5° x 5° latitude by longitude, classified as low (pink), medium (red) and high (maroon) for the Indian Ocean for the period 1977-78 to 2001-02. The pale blue line indicates the maximum sea-ice extent and the dark blue line indicates the location of the Antarctic Polar Front.

6.2.3 IUCN Status

Figure 6.4 displays the spatial distribution of species with an elevated IUCN Status (EN or VU). The data values for the classes of low, medium and high are given in Table 6.2. Proximity to subantarctic islands appears to be consistent with clustering of medium to high values for IUCN status, and high values clustering between 70° E and 115° E around the Antarctic Polar Front. The region around Iles Kerguelen and Heard Island and McDonald Islands is generally characterised by high values. The region south of 60° S and between 100° to 160° E displays a prevalence of low values, indicating that at-risk species, in terms of their IUCN status, are more likely to be found farther north. Therefore, as with species richness, access to open water, proximity to breeding sites and the Antarctic Polar Front may be important drivers for the distribution of species with an elevated IUCN status. These results are likely to be an artefact of the numerous species of albatross and petrels breeding on these subantarctic islands.

6.2.4 Shannon-Weaver Diversity Index

The distribution of Shannon-Weaver Diversity Index is shown in Figure 6.5, with the corresponding data values for the classes of low, medium and high in Table 6.2. The Shannon-Weaver Diversity Index aims to incorporate species richness and diversity in one measure. The distributions of high, medium and low values for the Shannon-Weaver Diversity Index are almost identical to those exhibited for species richness (Figure 6.3). For example, species richness and Shannon-Weaver diversity index are highly correlated at the 1 degree scale ($r = 0.959$, significant at the 0.01 level). Therefore, for this study the Shannon-Weaver Diversity Index was not found to reflect both species richness and density, it simply seems to duplicate the same characteristics as species richness. It appears that as a measure of both species richness and density, the Shannon-Weaver Diversity Index is insufficient and hence was not used further in this study.

6.3 Key Characteristics of the Study Area

The study area refers to the Indian sector of the Southern Ocean, or the region south of 40°S and 45° to 160°E where seabird observations have been recorded annually (except for one season) since 1980/81 (Woehler et al. 2003). It is useful to consider the key characteristics of the study area in order to draw comparisons to high conservation value areas identified from the use of the biodiversity surrogates of species density,

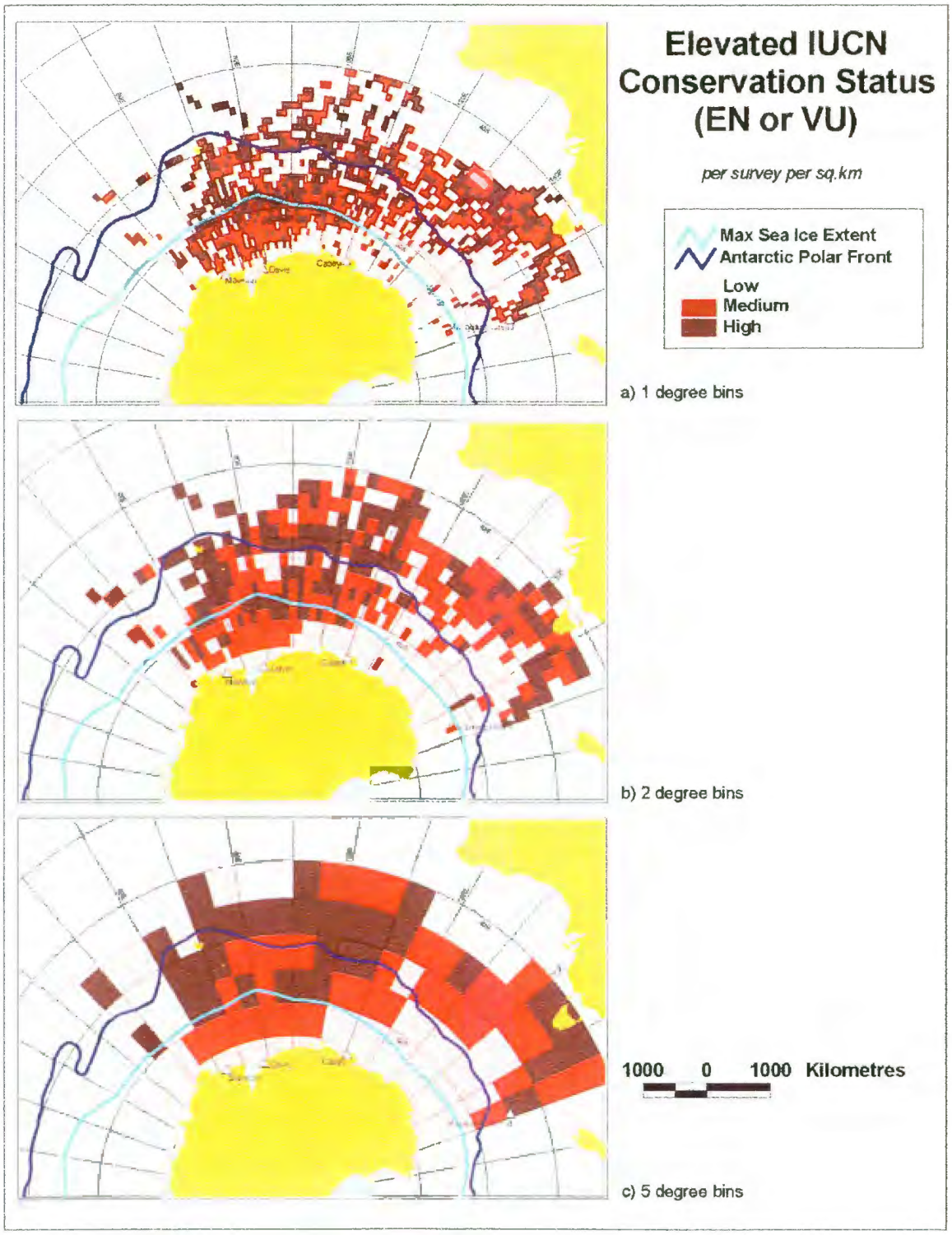


Figure 6.4 Elevated IUCN Conservation Status

Distribution of seabirds with IUCN Red List categories of Endangered or Vulnerable (number of birds/km²/survey) at 1° x 1°, 2° x 2° and 5° x 5° latitude by longitude, classified as low (pink), medium (red) and high (maroon) for the Indian Ocean for the period 1977-78 to 2001-02. The pale blue line indicates the maximum sea-ice extent and the dark blue line indicates the location of the Antarctic Polar Front.

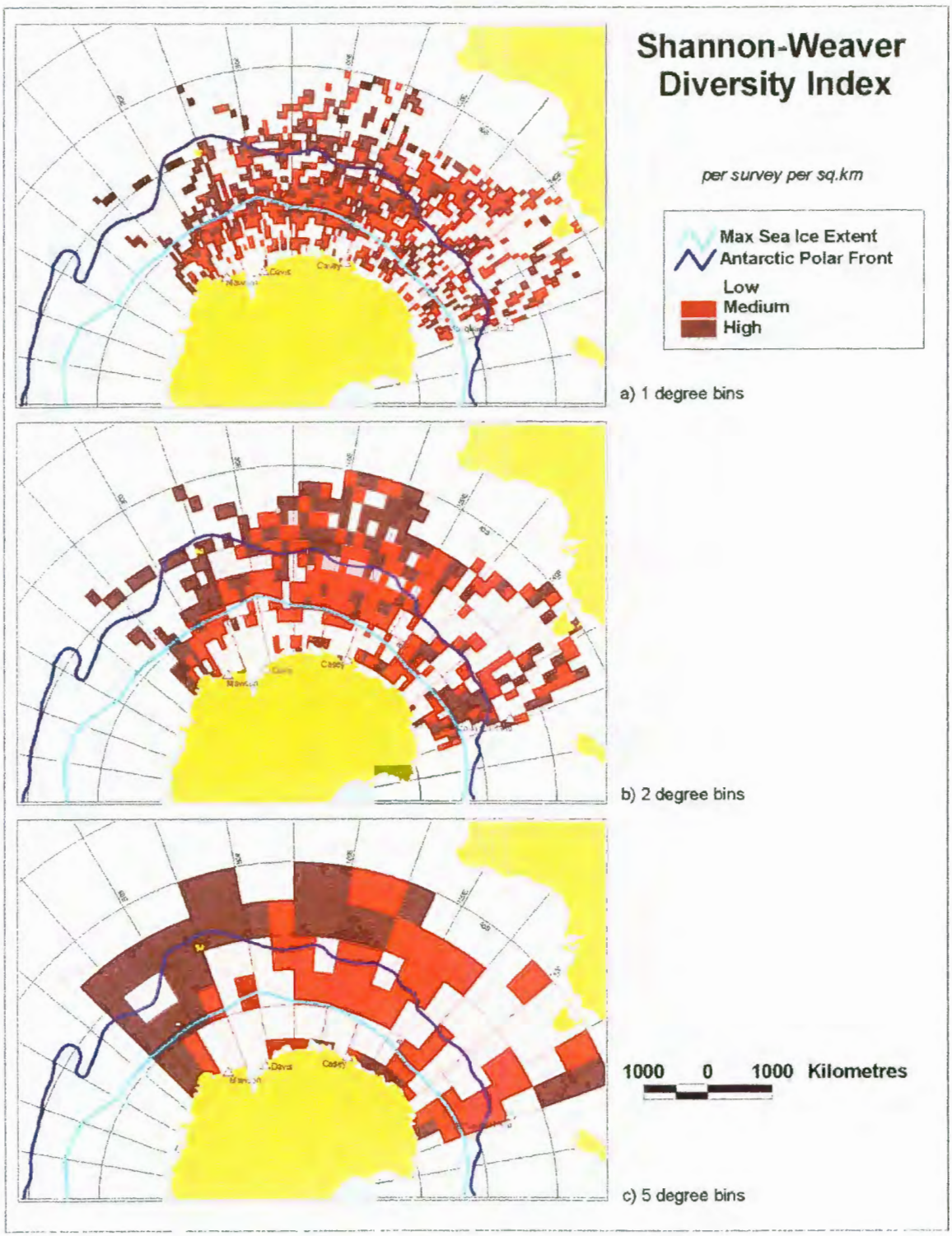


Figure 6.5 Shannon-Weaver Diversity Index

Seabird Diversity (Shannon-Weaver Diversity Index/km²/survey) at 1° x 1°, 2° x 2° and 5° x 5° latitude by longitude, classified as low (pink), medium (red) and high (maroon) for the Indian Ocean for the period 1977-78 to 2001-02. The pale blue line indicates the maximum sea-ice extent and the dark blue line indicates the location of the Antarctic Polar Front.

richness and IUCN status. Table 6.3 describes the key characteristics of the study area. The important figures to note are the adjusted average figures, which refer to the surrogate (e.g. density, richness, IUCN status) per survey per km^2 (normalised to a value of between 0 and 1). The next section describes how high conservation value areas and highest priority areas were identified, and how the adjusted average values compare with the overall study area.

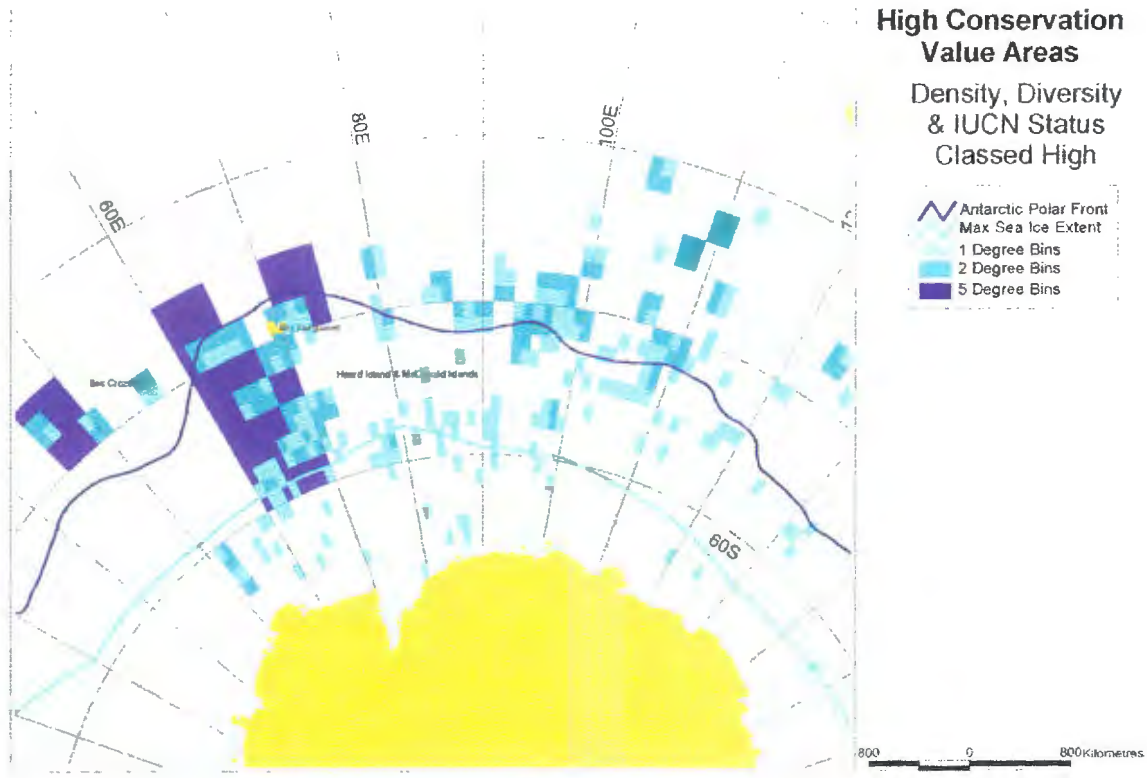
Table 6.3 Key Characteristics of the Study Area within the Southern Ocean

All Areas		Surveys	Null Obs.	Area (km^2)	Density	Richness	IUCN
1 degree bins	*Sum*	33,549	3,788	12,083,248	109,010	17,032	19,462
n = 1781	*Average*	18.84	2.13	6,785	61.21	9.56	10.93
	Adjusted Avg.	-	-	-	0.15	0.13	0.15
2 degree bins	*Sum*	33,482	3,788	16,180,731	109,241	8,722	19,496
n = 585	*Average*	57.23	6.48	27,659	186.74	14.91	33.33
	Adjusted Avg.	-	-	-	0.25	0.11	0.16
5 degree bins	*Sum*	33,366	3,788	21,186,749	109,010	2,988	18,971
n = 124	*Average*	269.08	30.55	170,861	879.11	24.10	152.99
	Adjusted Avg.	-	-	-	0.28	0.10	0.26

6.4 High Conservation Value Areas in the Southern Ocean

Areas with clusters of 'high' classing sets have been identified for each surrogate individually. Figure 6.6 displays high conservation value areas. High conservation value areas identified were characterised by high values for each of the density, richness and IUCN status classing sets. Figure 6.6 displays high conservation value areas for the 1 degree bins (aqua, n = 192), 2 degree bins (jade, n = 47) and 5 degree bins (royal blue, n = 7). The key characteristics of the high conservation value areas are provided in the corresponding table, and comparisons are drawn based upon the adjusted average values for density, richness and IUCN status versus those observed for the study area (Table 6.3).

An aggregation of cells is evident around the Antarctic Polar Front and is particularly strong around Iles Kerguelen. The region between 60° to 70° E, and 50° S to 60° S, which lies southwest of Iles Kerguelen and Heard Island and McDonald Islands, located between the Antarctic Polar Front and maximum sea-ice extent, was identified as a high conservation value area. In all cases the high conservation value areas identified exhibited significantly higher adjusted average values for density, richness and IUCN



High Conservation Value Areas		Surveys	Null Obs.	Area (km²)	Density	Richness	IUCN
1 degree							
bins	*Sum*	867	39	1,363,526	5,113	1,699	1,664
n = 192	*Average*	4.50	0.20	7,102	26.60	8.80	8.70
	Adjusted Avg.	-	-	-	0.25	0.31	0.41
2 degree							
bins	*Sum*	351	24	1,450,424	2,167	552	761
n = 47	*Average*	7.50	0.50	30,860	46.10	11.70	16.20
	Adjusted Avg.	-	-	-	0.43	0.30	0.45
5 degree							
bins	*Sum*	192	26	1,334,511	1,004	131	288
n = 7	*Average*	27.40	3.70	190,644	143.40	18.70	41.10
	Adjusted Avg.	-	-		0.58	0.35	0.74

Figure 6.6 High Conservation Value Areas for the Indian Sector of the Southern Ocean

Distribution of high priority conservation areas, based on their classification of 'high' for each of species density, species richness and IUCN status (per km²/survey) at 1° x 1° (aqua), 2° x 2° (jade) and 5° x 5° (royal blue) latitude by longitude for the Indian Ocean for the period 1977-78 to 2001-02. The pale blue line indicates the maximum sea-ice extent and the dark blue line indicates the location of the Antarctic Polar Front.

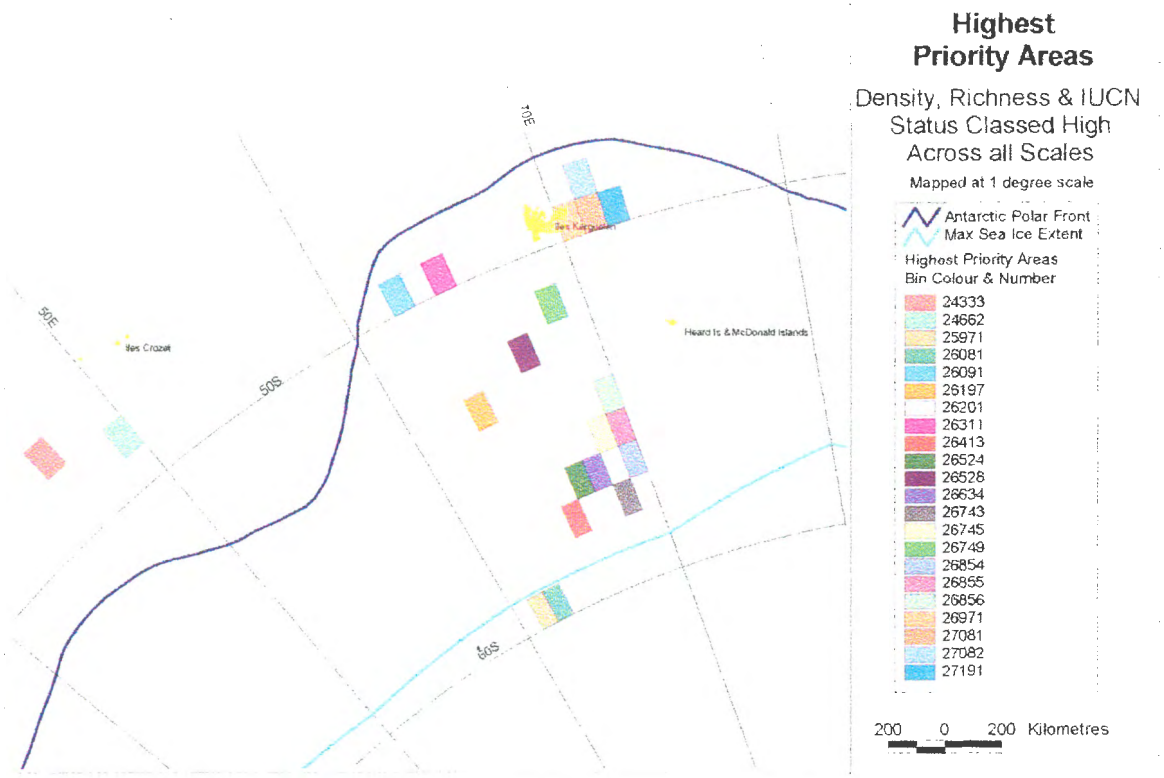
by the high conservation value areas was 1,363,526km^2 (averaging 7,102km^2) for the 1 degree bins; 1,450,424km^2 (averaging 30,860km^2) for the 2 degree bins; and 1,334,511km^2 (averaging 190,644km^2) for the 5 degree bins. These represent 11.3%, 9.0% and 6.3% of the study area respectively.

6.5 Highest Priority Areas for Action in the Southern Ocean

The aim of this study was to identify one potential mechanism by which to identify priority areas for conservation action in the high seas of the Southern Ocean. It may not be practical or politically desirable to protect all high conservation value areas shown in Figure 6.6. In order to reduce the number of high conservation value areas identified for possible conservation action, it is possible to add a further filter to these bins. Figure 6.7 illustrates the highest priority areas for the study area, with the values for density, richness and IUCN status displayed in the corresponding table. A detailed description of seabird observations is provided in Table 6.4, which describes the latitude and longitude of bins identified as highest priority areas, their corresponding bin number, the number and types of species observed and IUCN status. Areas were selected that were characterised by 'high' values for density, richness, and IUCN status classing sets at all three spatial scales of 1 degree, 2 degree and 5 degree bins. For practical purposes the highest priority areas were mapped and described at the 1 degree bin size (n = 22).

There appears to be a relationship between the location and bathymetry of the Kerguelen Plateau and the location of these highesr priority areas. The Kerguelen Plateau is known to be particularly rich in marine living resources (i.e. seabird prey species) that aggregate over the nutrient-rich continental shelf zone, and is subject to high levels of fishing – particularly IUU fishing (Constable et al. 2000, Gjerde and Breide 2003). A clustering of four bins is apparent immediately east of Iles Kerguelen, and again a larger aggregation of highest priority bins is present southwest of Heard Island and McDonald Islands. Proximity to open sea and breeding areas on Iles Kerguelen, Heard Island and McDonald Islands, and to a lesser extent the Iles Crozet, could also be drivers of these results[2]. The adjusted average values for density, richness and IUCN status were 1.8, 3.5 and 3.4 times higher than the study area respectively. The highest priority areas represent 1.35% of the study area (at 1 degree bin size) or

[2] Hydrographic and atmospheric factors can also influence bird foraging behaviour.



Highest Priority Areas		Surveys	Null Obs.	Area (km^2)	Density	Richness	IUCN
1 degree bins	*Sum*	57	6	162,981	424.00	179.00	40.03
n = 22	*Average*	2.59	0.27	7,408	19.27	8.14	1.82
	Adjusted Avg.	-	-	-	0.27	0.47	0.51

Figure 6.7 Highest Priority Areas for the Indian Sector of the Southern Ocean

Distribution of urgent priority conservation areas (each at 1° x 1° latitude by longitude), based on the overlap at all three spatial scales of 'high' classifications for each of species density, species richness and IUCN status (per km^2/survey) for the Indian Ocean for the period 1977-78 to 2001-02. The pale blue line indicates the maximum sea-ice extent and the dark blue line indicates the location of the Antarctic Polar Front.

162,981km^2. All of the highest priority areas identified in Table 6.4 are worthy of consideration for protection based upon the species richness, species density and IUCN status of the seabirds within these areas. The spatial bins that displayed the highest adjusted averages across species density, species richness and IUCN status were located at centroids: 64.5° S 49° E; 46.5° S 47.5° E; 67.5° S 47.5° E and 62.5° S 49.5° E.

Table 6.4 Highest Priority Areas by Species Observations

1 degree bin code	Lat.	Long.	Surveys (No.)	Density (No.)	Richness (No.)	IUCN (No.)	Density (Adj.*)	Richness (Adj.*)	IUCN (Adj.*)	Observed Species (No. obs)
24333	46.5	-47.5	1	12	7	6	0.40	0.67	0.96	ANPR (1); BBAL (1); CAPE (1); GHAL (5); LMSA (1); SOFU (2); WHPE (1)
24662	49.5	-48.5	2	25	11	5	0.43	0.54	0.41	ANPE (1); ANPR (1); BBAL (1); BLPR (4); CAPE (4); GHAL (2); LMSA (5); NGPE (1); SGPE (1); SOFU (4); WCPE (1)
25971	61.5	-59.5	2	10	3	4	0.22	0.19	0.43	LMSA (4); WCPE (4); WISP (2)
26081	62.5	-59.5	1	4	3	2	0.18	0.38	0.43	LMSA (1); WCPE (2); WISP (1)
26091	62.5	-49.5	1	13	8	4	0.46	0.80	0.67	ANPE (1); BLPE (1); CAPE (2); GHAL (3); LMSA (2); SOFU (2); WCPE (1); WHPE (1)
26197	63.5	-53.5	2	9	7	4	0.17	0.38	0.36	BLPE (1); CAPE (1); GHAL (1); NGPE (2); SGPE (1); WCPE (2); WISP (1)
26201	63.5	-49.5	2	18	10	3	0.32	0.50	0.25	BBAL (1); BLPR (3); CAPE (4); GHAL (1); KEPE (1); LMSA (1); SGDP (1); SOFU (4); WCPE (1); WHPE (1)
26311	64.5	-49.5	1	12	10	4	0.42	1.00	0.67	BLPE (1); CAPE (1); FUPR (1); GHAL (1); LMSA (1); NBPR (1); NGPE (1); SOFU (2); WAAL (1); WCPE (2)
26413	65.5	-57.5	1	5	5	2	0.21	0.60	0.40	BBAL (1); BLPE (1); CAPE (1); LMSA (1); WCPE (1)
26524	66.5	-56.5	1	4	4	2	0.16	0.47	0.39	BLPE (1) LMSA (1); WAAL (1); WCPE (1)
26528	66.5	-52.5	1	5	5	3	0.19	0.53	0.53	BBAL (1); CODP (1); SGPE (1); WCPE (1); WISP (1)
26634	67.5	-56.5	1	8	6	5	0.33	0.71	0.98	CAPE (1); KEPE (1); LMSA (1); SGPE (1); WAAL (2); WCPE (2)
26743	68.5	-57.5	2	10	4	6	0.21	0.24	0.60	LMSA (1); WAAL (1); WCPE (5); WISP (3)
26745	68.5	-55.5	4	27	10	10	0.27	0.29	0.48	ADPE (2); BBAL (2); BBPR (2); CAPE (8); CODP (1); LMSA (2); SGPE (1); SOFU (1); WCPE (7); WISP (1)
26749	68.5	-51.5	4	32	14	6	0.29	0.37	0.26	ARTE (1); BBPR (1); BLPE (3); CAPE (2); CODP (1); CRPE (3); LMSA (2); NGPE (4); SUSK (2); WAAL (2); WBSP (4); WCPE (4); WHPE (1); WISP (2)
26854	69.5	-56.5	6	24	12	7	0.16	0.24	0.23	ANTE (1); BBPR (1); BLPE (2); CAPE (3); FAPR (1); LMSA (2); NBPR (1); NGPE (2); STSH (1); WCPE (7); WHPE (1); WISP (2)
26855	69.5	-55.5	1	8	6	3	0.32	0.69	0.57	BBAL (1); BLPE (1); CAPE (2); CODP (1); LMSA (1); WCPE (2)
26856	69.5	-54.5	3	14	5	7	0.18	0.19	0.43	BBAL (3); CAPE (4); LMSA (2); SOFU (1); WCPE (4)
26971	70.5	-49.5	16	148	27	31	0.32	0.17	0.32	BBAL (10); BBPR (2); BECO (26); BLPE (8); CAPE (11); CODP (1); CRPE (3); GBSP (1); GRPE (2); GWPE (1); KEGU (9); KEPE (8); KIPE (1); LMSA (3); NBPR (1); NGPE (17); ROPE (2); SGDP (2); SGPE (7); SOFU (1); SRAL (5); SUSK (2); WAAL (1); WBSP (1); WCPE (13); WHPE (7); WISP (3)
27081	71.5	-49.5	2	13	10	5	0.23	0.50	0.42	BBAL (1); BLPE (2); CAPE (1); KEPE (1); NGPE (2); SGPE (1); STSH (1); WAAL (1); WCPE (2); WISP (1)
27082	71.5	-48.5	2	18	8	9	0.31	0.39	0.74	BBAL (3); GRPE (1); KEPE (1); NGPE (1); SPPE (4); WAAL (2); WCPE (4); WISP (2)
27191	72.5	-49.5	1	5	4	4	0.18	0.40	0.67	BBAL (1); WAAL (1); WCPE (2); WISP (1)

* Adj. Refers to the adjusted figure of surrogate per survey per km² normalised to a value of between 0 and 1.

Table 6.5 Key Characteristics of High Conservation Value areas and Highest Priority Areas in the Southern Ocean

Bin size	High Conservation Value Areas/Highest Priority Areas km²	Study Area km²	% of Study Area
High Conservation Value Areas (1 degree bins)	1,363,526 (n = 192)	12,083,248 (n = 1781)	11.28
High Conservation Value Areas (2 degree bins)	1,450,424 (n = 47)	16,180,731 (n = 585)	8.96
High Conservation Value Areas (5 degree bins)	1,334,511 (n = 7)	21,186,749 (n = 124)	6.30
Highest Priority Areas (1 degree bins)	162,981 (n = 22)	12,083,248 (n = 1781)	1.35

4). Table 6.5 describes the spatial extent (km²) of the high conservation value areas and highest priority areas at each spatial scale compared with the study area[3].

Using the benchmark of 10% protection, at the 1 degree bin size a minimum of approximately 1,208,324.8km² of this region should be set aside. This could be achieved - and slightly exceeded at 11.28% - by setting aside all high conservation value areas identified at the 1 degree bin scale, which comprise 1,363,526km². However, at the 2 degree and 5 degree scale, protecting all high conservation value areas would not meet the 10% benchmark. If only the highest priority areas were designated, only some 1.35% of the study area would be protected, falling substantially short of the 10% target. The high conservation value areas and highest priority areas could be designated for any number of values/uses, which could range from strictly protected areas (e.g. marine sanctuaries) through to managed and/or multiple-use zones that may, for example, allow for resource extraction. Zoning and use decisions are generally made by the State exercising jurisdiction, but in the case of the Antarctic, the question of jurisdiction is complicated and, with the exception of some subantarctic islands, agreement has not yet been reached.

Designating the identified high conservation value areas or highest priority areas will not comprehensively protect the biodiversity of the study area, since the seabird sightings are used here as simply a surrogate for the marine biodiversity of the region and to

[3] The values representing the study area only refer to cells in the Indian Ocean sector of the Southern Ocean where observations were made. The total area covered increases with scale accordingly.

identify potential key sites for conservation consideration. However, there is evidence to suggest that sites with similar high conservation value for birds do correspond with important sites for other, non-seabird species (e.g. Brooks et al. 2001, Dallmeyer 2003). Furthermore, information on other species is not geographically comprehensive or representative, but decisions regarding the conservation and management of the high seas need to be made now using all available information, no matter how incomplete, and incorporating best-practice approaches. The use of seabirds as surrogates is an internationally recognised approach for the identification of potential candidate sites for protection (e.g. IBAs) which can also often protect sites important for other species. The characteristics that the highest priority areas appear to share include: proximity to subantarctic islands/breeding sites, the Antarctic Polar Front, and access to open water. The areas around Iles Kerguelen and south-west of Heard Island and McDonald Islands appear the most important in the study area region.

The preliminary exploration of the use of seabirds as surrogates in this study has enabled the identification of candidate sites on the high seas for conservation action in the high seas of the Indian sector of the Southern Ocean. With this in mind, further research is warranted elsewhere within the Southern Ocean, such as the application of complementarity methods for the selection of sites in the Southern Ocean, environmental domains analysis (e.g. Belbin 1993, 1995, Margules and Pressey 2000, Margules et al. 2002) or the application marine IBA criteria currently under development (BirdLife International 2005). This case study can not be a comprehensive assessment of areas for biodiversity conservation in the Indian sector of the Southern Ocean. The sites identified here could form one basis for the selection of MPAs; clearly there will be others when other data become available. As a minimum, the highest priority areas identified in Section 6.4 should be accorded the highest priority for conservation as pilot MPAs until such time that improved data are available (for example, on the distribution and abundance of other species found in the Southern Ocean). The growing recognition of the precautionary approach for marine protection supports this tactic. Furthermore, the Antarctic region has been highlighted as an area where the establishment of a pilot MPA may be appropriate (Gjerde 2003). In particular, the protection of seamounts found within the 4000 mile long Pacific-Antarctic ridge, and areas around Kerguelen Island and Heard Island and McDonald Islands bordering French and Australian Antarctic territories have been prioritised for

conservation action. There is limited information available on these areas, and they can be subject to high levels of IUU fishing, which pose a significant threat to the region (Gjerde 2003). The findings of this study reinforce this recommendation based upon bird values.

The protection of sites within the Treaty Area, or CCAMLR Region, must be implemented within the ATS and with the cooperation and input of the CCAMLR Commission. Therefore, Contracting Parties to the ATS should collaborate and cooperate in implementing appropriate protection with consideration of all stakeholder needs. Any proposed MPA must be submitted to the CCAMLR Commission for approval before being recommended for designation at an ATCP. At the CCAMLR Commission Workshop on MPAs in 2005, participants recognised the need for MPAs and identified deficiencies in coverage of representative areas, scientific reference areas and areas vulnerable to human impacts (CCAMLR Commission 2005, para. 62). The workshop also acknowledged that interim protection may be necessary until such time that better information was available in order to implement the CCAMLR Commission's precautionary approach (CCAMLR Commission 2005, para. 68).

Work has already begun with respect to collecting improved data on the marine environment. The Census of Antarctic Marine Life (CAML), part of the International Polar Year 2007-2008, will investigate the distribution and abundance of Antarctic marine biodiversity (see http://www.caml/org, cited September 2006). CAML has the potential to contribute greatly towards an improved understanding of Antarctic biodiversity, and MPA network planning.

The ATS and the CCAMLR Commission understand the compelling need to operate consistently with the appropriate international agreements and approaches. Such considerations should form part of any argument for protection. When considering sites for designation appropriate supporting documentation stating how the sites were selected via biodiversity surrogates must be included in any proposal and management plan. Some of the highest priority areas identified are located within national jurisdiction (in particular, around Iles Kerguelen), in which case the governing States could consider the results of this study and protection within their jurisdiction supporting the findings. Indeed, it is within the CCAMLR Commission's mandate to influence and collaborate

with States exercising jurisdiction in areas adjacent to the CCAMLR Region, as is the need to protect dependent and associated species.

Research priorities are to develop the ideas presented in this study, to verify and test the findings and perhaps create one or more pilot MPAs based upon the results presented here. Currently data quality and coverage are inadequate for other species, with the at sea dataset the only known long-term and comprehensive data presently available for the Indian sector of the Southern Ocean. This work will contribute to the development of a representative system of MPAs in the Southern Ocean and form part of the global network. Development of such a system will indicate to the global community the ongoing commitment of the ATS and CCAMLR to the conservation and sustainable use of the marine living resources of the Southern Ocean.

6.7 Summary

This chapter has considered how observations of seabirds at sea data covering the Indian sector of the Southern Ocean can be used to assist in the identification of areas worthy of conservation action or protection as MPAs in the Southern Ocean. The use of surrogates can be an effective means by which to address paucity of data on marine biodiversity until such time that more data become available. The identification of 22 highest priority areas provides a starting point for marine conservation strategies for the Indian sector of the Southern Ocean, which is generally adjacent to Australia's Antarctic territory and subantarctic islands. The final chapter draws together the policy and case study analyses to present a strategy for Antarctic marine conservation.

Chapter 7

7 CONCLUSION AND IMPLICATIONS

7.1 A Strategy for Antarctic Marine Conservation

This study has examined whether the ATS can accommodate marine conservation and sustainable use, and how international instruments and approaches apply within the Southern Ocean high seas. The study has also explored how, given the limited availability and quality of data on Southern Ocean marine biodiversity, the use of seabirds as surrogates for marine biodiversity can assist in the identification of high priority areas for marine conservation action.

The development and implementation of a high seas marine conservation program in the Southern Ocean requires the application of international law that facilitates a combination of species, *in-situ* and *ex-situ* conservation. Any strategy adopted should promote the notion of environmental stewardship, advocate the ecosystem approach and apply the precautionary principle to conservation and sustainable use. This study also addressed the question of whether such a framework exists under the ATS, other current international law, or whether a new instrument governing the high seas needs to be developed for effective marine protection.

As explained in Chapter 5, a new instrument for regulating high seas activities is unnecessary at this time –urgent action is required now. Any measures or instruments for the protection of the Antarctic and Southern Ocean should be implemented within the ATS. The 1999 Lima Declaration conceded that the ATS was the best (and only) way forward for the management of the Antarctic into the 21st century (ATCM XXIII 1999, Annex E), particularly as the ATS was increasingly collaborating with UNEP (Beck 2004). The support and cooperation of the ATCPs, and in particular members of the CCAMLR Commission, is critical in the application of any principles, approaches or instruments within the Southern Ocean region. The involvement of SCAR and the CEP in an advisory capacity is also crucial. Furthermore, any measures or instruments must also be consistent with obligations and rights set forth in LOSC (Kelleher et al. 1995, Gjerde 2001).

Over the last half-century membership of the Antarctic Treaty has expanded to include 45 Contracting Parties and to allow observer access to interested organisations such as the IUCN, IAATO, ASOC and the IMO. ATCPs hold all the decision-making power and need to take action on a global scale to increase support for all the instruments within the ATS. Because Antarctic Treaty Contracting Parties are amongst the most politically influential in the world (Beck 2004), they could strengthen the effectiveness and reach of the Antarctic legal regimes as a whole by inviting third-Party States to become Contracting Parties to appropriate instruments of the ATS. The CCAMLR Commission did this with Namibia and Mauritius. Namibia is now a Commission member, and Mauritius is an acceding State. Exposure of third-Party States to the decision-making process[1] (even if they do not hold voting rights) has resulted in improved support and implementation of CCAMLR conservation measures, for example with regard to IUU fishing, although it should be noted that this could lengthen the time taken and/or ability to gain consensus or majority votes necessary for decision-making. There is already evidence that ATCPs are now looking towards the global community and international environmental approaches for advice and guidance (ATCM XXVII / IP88 2004, ATCM XXVII / WP17 2004, Ramsar COP9 2005).

The current Antarctic system encourages Contracting Parties to ratify or accede to international instruments relevant to the Antarctic (e.g. ATCPs that are also Range States under the ACAP definition have been encouraged to ratify ACAP). ATCPs should encourage each other to sign and implement any international agreement that may have conservation benefits for Antarctic marine living resources, particularly the CBD, LOSC (and FSA), CMS (and ACAP), CITES, Ramsar, ICRW and the Compliance Agreement. ATCPs should also work with key international organisations and agreement Secretariats to develop mutually compatible goals and measures, sign MOUs (if appropriate) and encourage advocacy and support of the ATS. This may require organisations and Treaty Parties to further overcome old tensions and resistance regarding involvement of outside organisations such as the UN and associated bodies.
The past decade (particularly since the WSSD) has seen a growing number of organisations and instrument Secretariats working together and creating MOUs with the aim of developing mutually compatible goals. Contracting Parties to Ramsar, and the

[1] Whilst third-Party States or organisations (or in the case of the ATS, observers and/or Contracting Parties) do not have voting rights/decision-making status, they can be actively involved in meeting discussions or debates.

Ramsar Secretariat, have made substantial progress in this regard. At the 2005 Ramsar COP9, Resolution IX.5 (2005) endorsed collaboration and cooperation between five Secretariats of the CBD, CMS, CITES, Ramsar and WHC with the aim of developing a coordinated and cohesive approach to biodiversity conservation (Ramsar 2005). Furthermore, Resolution IX.4, the Ramsar Convention and conservation, production and sustainable use of fisheries resources, encourages Contracting Parties and the Secretariat to consider and cooperate with various fisheries related instruments, mentioning the CBD, FAO (and their CCRF) and CITES. A draft resolution was also submitted in 2005 by Switzerland (an Antarctic Treaty Contracting Party only) on developing synergies and mutual support between the Ramsar Convention on Wetlands and the Antarctic Treaty (Ramsar COP9 DR23, Rev. 1., see Appendix 4) to encourage cooperation and collaboration in areas of mutual interest, and confirming that there are areas in the Antarctic that meet, or partially meet, the criteria for designation as Ramsar sites. Although the first draft was not well received, interested Parties collaborated with Switzerland to arrive at a more agreeable second draft. The Draft Resolution has not yet been adopted. The CCAMLR Commission has already been engaged in dialogue with CITES Contracting Parties to address trade in Patagonian toothfish and to encourage CITES parties to adopt the CCAMLR Commission's CDS (CITES Conf 12.4 2003). However, no formal agreement or mechanism has yet been created between the CCAMLR Commission and CITES (CITES Secretariat 2004).

Proposals for cooperation between Secretariats, interested Parties and organisations do not, however, always run smoothly. An example of this was the Australian Government's attempts to list Patagonian toothfish in Appendix II of CITES (see Chapter 3 for discussion). Accordingly, any efforts of cooperation between Secretariats, organisations and interested States need to be transparent and collaborative from the outset, and gain sufficient political support prior to embarking on the formal designation process. Gaining agreement on conservation measures that will impact on commercial activities, as with the listing of Patagonian toothfish, is likely to be more challenging due to the economic implications of such a listing. This is certainly the case in the Antarctic, where the CCAMLR Commission has authority over MPA designations within the CCAMLR region. As yet, no Antarctic MPAs (ASPAs) have been designated in areas where there are substantial commercial fisheries activities. There is some doubt as to whether the CCAMLR Commission would allow such a

designation at all, given its mandate for allowing rational use. However, ASPAs 152 and 153 are in areas that formerly supported fisheries but that are now closed to fishing activities, and there was no objection by CCAMLR regarding their protected area status (Area 48.1).

In relation to the LOSC, the CCAMLR Commission should take a leading role to remove any ambiguity between the two instruments. Research and information exchange should be encouraged between scientific advisory bodies and researchers associated with LOSC, CCAMLR and other instruments of the ATS to enhance knowledge and understanding of the marine environment. A MOU could be formulated between the LOSC and CCAMLR Commission to clarify the intentions of the Treaty Parties and CCAMLR Commission members to work with LOSC towards a common goal of conservation and sustainable use in a manner consistent with both instruments. Alternatively, an implementing agreement of LOSC could be formulated that specifically addresses the high seas with the objective of removing any ambiguity and balancing the need for conservation and sustainable use of high seas marine living resources. Since implementing agreements can clarify and supersede aspects of LOSC, as with the 1994 Agreement Relating to the Implementation of Part XI of LOSC (Kimball 2001), there is nothing to say that the obligations of States with respect to the high seas could not be similarly clarified and strengthened. However, as previously stated, creating and implementing new agreements is a time-consuming process and more urgent action is needed right now.

The level of exploitation of Southern Ocean marine living resources has been substantially lower than other marine regions, so as the world's resources decline, attention will increasingly turn to the Southern Ocean and high seas. Pressure on high seas marine living resources must be abated. Kaye (2004) suggested that States with limited or no access to marine living resources within an EEZ of their own (i.e. land-locked States) have little choice but to fish in the high seas for marine living resources, unless they are able to purchase fishing rights to fish in the EEZ of other States under LOSC (Kaye 2004). To develop Kaye's idea further, under LOSC, States have an obligation to allow other States access to their marine living resources if they are not fully exploiting them. Providing that estimates of fishing capacity (maximum sustainable yield) within the EEZ are conservative and current, then a solution to high seas

overexploitation and IUU fishing could be to offer land-locked states the opportunity to purchase fishing rights to fish within the EEZ of other States. Any States that take up this right would be subject to the rules and regulations of the State granting access to their marine living resources. Such efforts have the potential to deflect some pressure off regions in the high seas subject to high levels of IUU fishing. Of course, the attraction of IUU fishing for many States (not just land-locked States) is to avoid paying for access to marine living resources, and these States are unlikely to take up an offer to buy fishing rights when they believe that they can continue to poach high seas resources. The only recourse for regional fisheries bodies would be to increase monitoring and enforcement, impose trade restrictions (such as CCAMLR Commission members not allowing the import of Patagonian toothfish without evidence that the stock was caught consistent with measures under CCAMLR), address reflagging and to apply political pressure to States known to be responsible for IUU fishing, as the CCAMLR Commission has done.

Simplification of existing international environmental law, removal of repetition and rationalisation could assist the global community in understanding and meeting their environmental obligations. Instruments that aren't fully effective or whose conservation concepts are outdated, such as the ICRW, could be either replaced or amended to address inadequacies. Alternatively, in the example of the Southern Ocean, the instruments of the ATS could be amended to cover whales and new measures put in place to ensure their conservation and sustainable use. Whales are a major component of the Antarctic marine ecosystem, and CCAMLR should not simply defer to the IWC on all matters relating to whales. At the very least, CCAMLR should continue to collaborate with the IWC on matters of mutual concern, specifically relating to the Southern Ocean whale sanctuary. Furthermore, currently Annex I of the Madrid Protocol does not require fisheries to follow the EIA process. Annex I could be amended to cover fisheries activities, which would no doubt have a positive influence on conservation outcomes.

The Antarctic Treaty, CCAS, and Madrid Protocol all apply to the region south of 60°, whereas CCAMLR applies to the region defined broadly by the Polar Frontal Zone, so is based on physical, not arbitrary boundaries hence incorporating an ecosystem approach. ATCPs should consider changing the scope of all instruments of the ATS to

adopt the boundaries of the CCAMLR Region in order to apply a consistent approach to environmental management and to incorporate an ecosystem approach. The Madrid Protocol already refers to dependent and associated ecosystems, so could be considered to imply that the scope of the Madrid Protocol applies to areas beyond the Treaty region. If all instruments of the ATS were revised to apply to the CCAMLR Region, this interpretation becomes more explicit and adds some consistency to the application of measures within the ATS. Also, given the international reputation of CCAMLR regarding its endorsement of the ecosystem and precautionary approach, this type of change is likely to be well received and would not be seen as a major threat to the operation of the ATS.

International organisations, including NGOs, RFMOs and scientific and research bodies should play a key role in the protection of the high seas. Organisations such as the UN and its agencies such as the FAO, UNEP, World Wildlife Fund (WWF), IUCN, IMO and WCMC all play some role in global conservation initiatives. SCAR, the CEP, the CCAMLR Commission (and various working groups and committees involved within the ATS) should continue to collaborate with these organisations to inform the decision-making process and ensure international environmental best practises are adopted in the Antarctic. Treaty Parties should consider collaborating with the IMO to explore marine conservation options and strengthen the mandate of both the IMO and ATS in the process. A central body such as UNEP, the FAO or the IMO (each of which have extensive membership and influence), could become the central monitoring and enforcement body on these issues and even establish a high seas conservation fund. Such a fund could extract resources from key stakeholders who could become members of the fund by a set contribution. If the international community pooled their resources in this way, IUU fishing and the monitoring and regulation of international law could be undertaken consistently and collaboratively and reduce duplication in areas of mutual interest, such as the high seas. A unified approach to the threats to the high seas is much more likely to produce better conservation outcomes, and be more cost effective, than a fragmented approach that is managed at the RFMO level.

Comprehensive conservation of the marine environment in the Southern Ocean is plausible within current environment law (Osborn 2001, Gjerde 2003). The evolution and success of the ATS is an example of international law that has overcome political

barriers and disputes over territorial claims to conserve the Antarctic for peace and science. ATCPs should build upon their success and work closely with the CBD and LOSC to ensure a consistent approach to marine conservation and sustainable use. Both the CBD and LOSC, either in their text or associated measures, explicitly refer to obligations of Contracting Parties on the high seas, and each agreement is currently investigating means by which to address high seas conservation and develop MPA networks to contribute to the global representative network of MPAs. ATCPs should collaborate with the Secretariats of these Agreements, together with relevant organisations and interested States, to develop an action plan for the Southern Ocean. If adopted as a measure under the ATS, or CCAMLR's conservation measures, Contracting Parties would be obliged to adopt and implement any such plan.

MPAs should not simply be set aside for the purposes of scientific research or fisheries management. A network of representative sites should be developed that encompasses all values (such as intrinsic, baseline monitoring of stocks or wilderness preservation) and to provide insurance against unforeseen environmental changes and human impacts. Connectivity with existing ASPAs and ASMAs, as well as MPAs or TPAs on subantarctic islands should also be considered to protect species across their range and develop protected area corridors (Kelleher et al. 1994, Chown et a. 2001). ATCPs and the CCAMLR Commission must be conscious of maintaining a balance between allowing use of Antarctic marine living resources in recognition of the regions commercial values, and the need to protect the wilderness, biodiversity, baseline or aesthetic values of the region. High seas marine protection in the Antarctic can be achieved under current international law, but the success of such efforts is subject to political will and the cooperative efforts of signatories to the CBD, LOSC (amongst other key instruments such as FSA, CMS and CITES) and the Contracting Parties and advisory bodies to the instruments of the ATS, scientific bodies and organisations active or interested in the region.

7.2 Seabirds as Surrogates: Southern Ocean High Priority Areas

The case study was undertaken to assess whether the seabirds at sea database spanning 20 years could be useful in the identification and prioritisation of candidate sites for protection. Four surrogate measures were used: species density, species richness, IUCN conservation status (VU or EN) and Shannon-Weaver Diversity Index. Shannon-

Weaver Diversity Index was discarded as it was found to duplicate the results of the species richness index. Combining the remaining three surrogates, the study identified 22 sites at the 1 degree scale that are candidates for highest priority conservation action. The use of seabirds as surrogates has aided in the identification of high priority areas for action and provided a firm starting point for Southern Ocean conservation action. The results may be used with an adaptive management approach until such time that the CCAMLR Commission's bioregionalisation has been completed and MPA priorities are based upon more comprehensive data.

One or more of these 22 sites could be immediately designated as pilot MPAs in the Southern Ocean. The sites could be designated as either ASPAs or as part of the CEMP network of sites, which to date comprises just two sites. These sites may be subject to strict protection and no-use, or may be managed for sustainable use of the marine living resources therein, as is currently the case by the CCAMLR Commission. The findings or this study are consistent with recommendations made by Gjerde (2003) regarding Antarctic pilot MPAs around Kerguelen Island and Heard Island and McDonald Islands. Protection of marine areas around these Islands is particularly urgent due to high the levels of IUU fishing in the region both within national jurisdiction of Australia and France, and in adjacent high seas areas.

7.3 Areas for Future Research

This study focused on several key international instruments and approaches that could apply to the high seas. It was beyond the scope of this study to consider regional, sub-regional and local instruments and approaches that may be applied or adapted to the high seas. Further study of such instruments could provide valuable insights into effective implementation of conservation measures.

The funding of monitoring and enforcement of MPAs in the high seas, and in particular the Southern Ocean, is an issue that requires further research. Enforcement of measures to third-Party States on the high seas is questionable and ambiguous. Although briefly touched on in this study, the protection of MPAs will be costly and logistically challenging. A strategy for funding and supporting Antarctic MPAs needs to be developed, and since it is of global concern, should not be an issue left solely to the ATS.

One of the main problems of international law is that there are numerous overlapping instruments. Duplication or contradictions between instruments can create confusion for States attempting to fulfil their obligations under multiple instruments. A central administrating body (perhaps the United Nations or FAO) could create a database that attempts to simplify and cross-reference all major international environmental law to produce a concrete set of obligations for States that have ratified one or more international instruments without any repetition. For example, if a State has signed LOSC, CBD or FSA, then the creation of a marine protected area network under national law could in fact meet their obligations for the conservation and sustainable use of marine living resources under each of these instruments simultaneously.

The at sea dataset contains other environmental variables taken *in-situ* (see Chapter 4 for details). Further analysis of the environmental variables, in combination with the at sea seabird sightings is warranted to validate and improve the results[2]. Also, species distribution and abundance has been found to be associated with environmental factors (Croxall 1992), such as concentrations of chlorophyll and location along the continental shelf break (Smetacek and Nicol 2005), and this could be investigated and associations tested. In particular, analyses of environmental or other interactions could be undertaken to assess the importance of the 22 highest priority areas for biodiversity conservation, and to assess any threats that might exist in those areas. The presence of a significant threat elevates the urgency to protect these sites. IUU fishing is known to be a particular problem around subantarctic islands, and represents the most substantial threat to the high conservation value areas and highest priority areas identified. Since these areas may incorporate regions within national jurisdiction, any efforts to designate or inform the decision-making process must be made in collaboration with the States exercising jurisdiction, in this case Australia and France. Cooperation with these States, the CCAMLR Commission and the ATCPs is key in establishing and implementing protective measures for sites identified in this study.

Seabird density and abundance has been associated with krill swarms in the Southern Ocean (Hunt 1991). Fisheries data could be incorporated into area selection algorithms to aid in area selection and prioritisation. The CCAMLR Commission collects

[2] Some work has been completed on this (see Woehler EJ, Raymond B, Watts D (2003) Decadal-scale seabird assemblages in Prydz Bay, East Antarctica. Marine Ecology Progress Series 251:299-310), however not in the context of MPA network development.

substantial volumes of fisheries related information which they subsequently use to feed into their predator-prey models and predict maximum sustainable yield. This data could be overlayed onto the seabirds at sea dataset to detect trends and prioritise sites further.

7.4 Concluding Remarks

This thesis has drawn together policy and science to consider the most appropriate approaches for Southern Ocean marine conservation in the current political climate. A need does exist on a global scale to develop a network of MPAs, together with a set of complementary measures for species, habitat and ecosystem protection. The Antarctic region is already subject to a strong conservation framework, which can be strengthened by considering and applying appropriate international law in the context of the ATS. Implementation now presents the greatest ongoing challenge for the ATS. This study has contributed towards the identification of appropriate approaches from both a policy perspective, and from a scientific perspective, to contribute to the debate on area selection and prioritisation.

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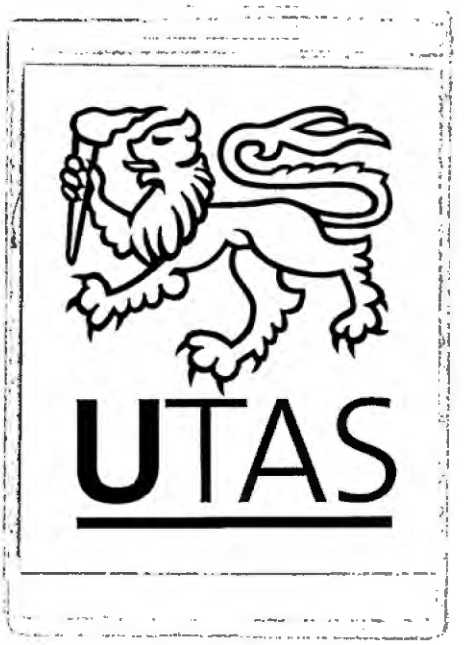
Appendix 1 Permission Forms

The following signed forms grant Jane Harris permission to use the information published in co-authored papers that she has written or contributed to, in the content and background of this thesis.



Appendix 1

The signed permission forms in relation to co-authored papers have been removed from this section due to copyright or proprietary reasons

Appendix 2 LOSC – Annex 1, Highly Migratory Species

1. Albacore tuna: *Thunnus alalunga.*
2. Bluefin tuna: *Thunnus thynnus.*
3. Bigeye tuna: *Thunnus obesus.*
4. Skipjack tuna: *Katsuwonus pelamis.*
5. Yellowfin tuna: *Thunnus albacares.*
6. Blackfin tuna: *Thunnus atlanticus.*
7. Little tuna: *Euthynnus alletteratus; Euthynnus affinis.*
8. Southern bluefin tuna: *Thunnus maccoyii.*
9. Frigate mackerel: *Auxis thazard; Auxis rochei.*
10. Pomfrets: Family *Bramidae.*
11. Marlins: *Tetrapturus angustirostris; Tetrapturus belone; Tetrapturus pfluegeri; Tetrapturus albidus; Tetrapturus audax; Tetrapturus georgei; Makaira mazara; Makaira indica; Makaira nigricans.*
12. Sail-fishes: *Istiophorus platypterus; Istiophorus albicans.*
13. Swordfish: *Xiphias gladius.*
14. Sauries: *Scomberesox saurus; Cololabis saira; Cololabis adocetus; Scomberesox saurus scombroides.*
15. Dolphin: *Coryphaena hippurus; Coryphaena equiselis.*
16. Oceanic sharks: *Hexanchus griseus; Cetorhinus maximus;* Family *Alopiidae; Rhincodon typus;* Family *Carcharhinidae;* Family *Sphyrnidae;* Family *Isurida.*
17. Cetaceans: Family *Physeteridae;* Family *Balaenopteridae;* Family *Balaenidae;* Family *Eschrichtiidae;* Family *Monodontidae;* Family *Ziphiidae;* Family *Delphinidae.*

Appendix 3 SCAR Ecosystem Matrices

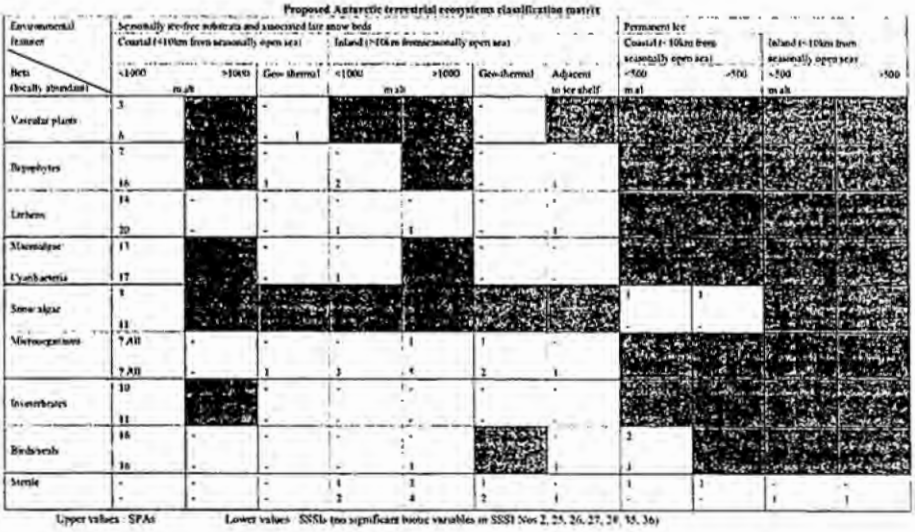
SCAR Ecosystems Matrix
Proposed Antarctic marine ecosystems classification matrix

Environmental variables	PELAGIC-NERITIC	BENTHIC				LITTORAL			
		Bathyal >500m	Shelf zone (c.500-200m)		Sub-littoral (c.200-5m)		Rock/ boulder	Pebble	Sand, mud and/or shell	Ice
			Hard bottom	Soft bottom	Hard bottom	Soft bottom				
Permanent ice										
Seasonal ice										
Absence of ice										
Fresh water influence										
Enclosed water mass										
Geothermal influence										

Proposed Antarctic inland water ecosystems classification matrix

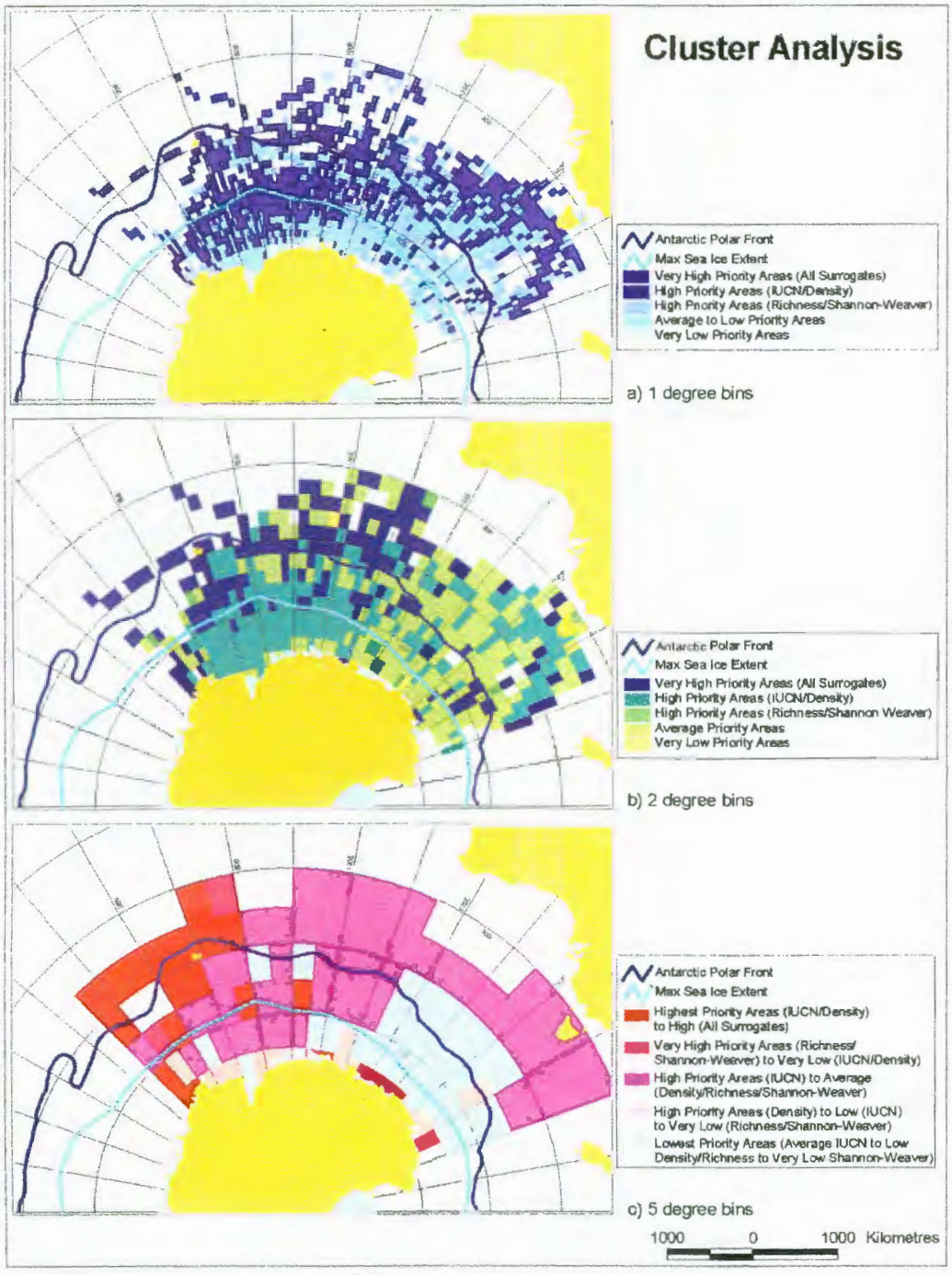
Environmental variables / Biotic variables	LAKES/PONDS										STREAMS	
	Permanent						Ephemeral				Over ice	Over rock/soil
	Fresh S<3g/l		Intermediate salinity S=3-30g/l		High salinity S>30g/l		Ice dammed		Rock or moraine dammed			
	a	b	a	b	A	b	Wholly (meh pools etc)	Partly (rock walls etc)	Sea influenced	Not sea influenced		
Sterile												
Heterotrophs only												
a Annual algal communities												
o Perennial algal mat												
r o Moss p												
h Phytoplankton s												
Herbivore invertebrates												
Carnivore invertebrates												

S: Salinity a: Chemically stratified b: Chemically non-stratified



Source: Valencia (2000: 29-31)

Appendix 4 Cluster Analysis



Appendix 4 Cluster Analysis The above maps illustrate the results of cluster analysis run at the 1 degree, 2 degree and five degree scales (see Chapter 4). Cluster analysis tests the associations between areas and surrogates and then allocates each spatial bin into one of five groups (note, the cluster analysis is run independently at each spatial scale, therefore the groups are not comparable with each other). The four surrogates formed the basis of this classification (density, richness, IUCN and Shannon-Weaver). The darkest colours at each bin size generally represent the areas of highest priority based upon the characteristics of the surrogates, whilst the lightest colours tend to be areas of low priority.

Appendix 5 Ramsar COP9 DR23, Rev. 1

9th Meeting of the Conference of the Parties to the Convention on Wetlands (Ramsar, Iran, 1971)

"Wetlands and water: supporting life, sustaining livelihoods"

Kampala, Uganda, 8-15 November 2005

Ramsar COP9 DR23, Rev. 1

Agenda item XV

Developing synergies and mutual support between the Ramsar Convention on Wetlands and the Antarctic Treaty

Submitted by Switzerland

Note by the Secretariat:

Following discussions between Switzerland, the Secretariat, and a number of interested Parties, Switzerland has withdrawn its first version of DR23 and substituted this revised version in its place for the consideration of the COP.

1. CONSIDERING the global importance of the Antarctic in terms of area and volume of (mostly frozen) freshwater resources,

2 RECALLING that wetlands, as defined by the Ramsar Convention, are "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres", and NOTING that according to this definition, various types of wetlands do occur in the Antarctic region,

3. AWARE of the presence of a number of ecosystems in the Antarctic that correspond to the Ramsar definition of wetlands, including glacial lakes – some located in the Transantarctic Mountains – subglacial lakes (lying hidden below thick layers of ice), depressions left by glacial retreat and fed by glacial meltwater over summer, pools and depressions on glaciers and ice fields, glaciers (including the largest valley glacier in the world), seasonally frozen rivers (e.g., discharging from glaciers forelands), coastal ecosystems, etc., and

4. CONSCIOUS of the necessity and value to develop synergies and mutual support between the Ramsar Convention on Wetlands and the Antarctic Treaty,

THE CONFERENCE OF THE CONTRACTING PARTIES

5. REQUESTS that the Ramsar Secretariat and the Antarctic Treaty Secretariat establish, on a regular basis, mutual exchange of information on common priority areas, with special focus on complementarity and synergies between the "conservation and wise use of wetlands" under the Ramsar Convention on Wetlands (1971) and the "protection and

judicious use" of Specially Protected Areas under Annex V of the Protocol on Environmental Protection (1991) to the Antarctic Treaty;

6. PROPOSES, as a immediate first step, that this mutual exchange of information be materialized by the granting of observer status to the Committee on Environmental Protection (CEP) of the Antarctic Treaty in the Ramsar Scientific and Technical Review Panel (STRP), and INVITES the Antarctic Treaty to consider granting to the Ramsar STRP a similar observer status in its Committee on Environmental Protection (CEP);

7. ENCOURAGES the Antarctic Treaty to invite the Secretary General of the Ramsar Convention to its XXIXth Consultative Meeting to take place 12-23 June 2006 in Edinburgh, UK, and REQUESTS the Ramsar Secretariat to invite the Executive Secretary of the Antarctic Treaty to Ramsar's 10th meeting of the Contracting Parties in 2008;

8. INVITES the Antarctic Treaty to present, at Ramsar COP10 in 2008, a list of Specially Protected Areas (SPAs) which would correspond with, or integrate at least partly, some of the Ramsar Criteria for Identifying Wetlands of International Importance;

9. ENCOURAGES the Ramsar Administrative Authorities and the Antarctic Parties to develop regular cooperation and exchange of information at both the national and the international levels; and

10. INSTRUCTS the Ramsar Secretary General to report to COP10 on the first triennium of cooperation between the Convention on Wetlands and the Antarctic Treaty.